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Tracking System Data Analysis Report
Ranger VII Final Report

A. L. Berman

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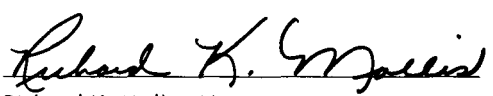

Richard K. Mallis, *Manager*
Communications Engineering
and Operations Section

JET PROPULSION LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY
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June 1, 1965

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ABSTRACT

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This report is an analysis of the Deep Space Instrumentation Facility tracking performance during the *Ranger VII* mission. Included are ground system configurations, station view periods, and a discussion by station and view period of all tracking data, i. e., angular and doppler, taken by the tracking stations. A summary is given of the tracking data which were actually used to determine the spacecraft orbit and the noise statistics of these data. Author

I. INTRODUCTION

This Report sets forth the results of the analysis of the tracking performance of the Deep Space Instrumentation Facility (DSIF) during the *Ranger VII* mission. It deals with the preflight preparations of the DSIF stations, the results of the postflight analysis of the DSIF station flight operations, and the postflight tracking data reduction by the orbit determination program (ODP).

A. History of the Mission

The *Ranger VII* spacecraft was launched with an *Atlas/Agena B* booster system from Cape Kennedy on July 28, 1964. Liftoff occurred at 16:50:07.873 GMT (Greenwich Mean Time) and *Atlas/Agena* separation occurred at 16:55:16.8 GMT. *Agena* first engine cutoff occurred at 16:58:34.4 GMT, marking injection into parking orbit, and at 17:18:32.1 the parking orbit was terminated by *Agena* second engine ignition. *Agena* second engine cutoff occurred at 17:20:01.0, concluding powered flight and marking injection of the spacecraft into lunar transfer orbit. Approximately 155 sec after injection, *Agena*/spacecraft separation occurred, and successful completion of further on-board events resulted in Earth and Sun acquisition by the spacecraft.

Initial DSIF acquisition by Station 59 occurred at 17:20:50 GMT, and the DSIF stations tracked the spacecraft continuously from that time until impact. Actual station tracking periods, as well as nominal station view periods, are listed in Table 1. Initial orbit computations showed that the spacecraft would impact the Moon. To secure more favorable terminal conditions a midcourse maneuver was executed during the period 10:27:09 to 10:27:58 GMT, July 29, 1964 by command from Station 12. Table 2 lists all commands sent to the *Ranger VII* spacecraft.

The midcourse maneuver was fully successful, and a nominal terminal maneuver was, therefore, unnecessary. The TV subsystem operated successfully during the terminal phase of the flight, and impact was recorded at 13:25:50.029 on July 31, 1964.

Table 1. Nominal[a] view periods vs actual tracking at DSIF stations

Date	DSIF station	Nominal rise, GMT	Nominal set, GMT	Nominal view period	Acquisition by station	Loss of signal by station	Actual view period
July 28, 1964	51	17:21:17	17:32:00	$00^h10^m43^s$	17:21:38	17:32:55	$00^h11^m17^s$
	59	17:21:17	17:32:00	$00^h10^m43^s$	17:20:50	17:37:53	$00^h17^m03^s$
	41	17:36:54	00:46:21[b]	$07^h09^m27^s$	17:35:24	01:17:00	$07^h41^m36^s$
	51	20:42:52	08:28:04[b]	$11^h45^m12^s$	20:45:50	08:54:29	$12^h08^m39^s$
July 29, 1964	12	07:11:54	18:36:01	$11^h24^m07^s$	06:44:10	18:45:35	$12^h01^m25^s$
	41	14:38:45	01:24:04[b]	$10^h45^m19^s$	14:13:55	01:49:00	$11^h35^m05^s$
	51	22:00:10	08:48:32[b]	$10^h48^m22^s$	22:02:45	09:12:03	$11^h09^m18^s$
July 30, 1964	12	07:20:28	18:59:03	$11^h38^m35^s$	06:55:30	18:59:49	$12^h04^m19^s$
	41	14:59:08	01:31:08[b]	$10^h32^m00^s$	14:36:03	01:59:00	$11^h22^m57^s$
	51	22:14:05	08:53:41[b]	$10^h39^m36^s$	22:13:17	09:14:37	$11^h01^m20^s$
July 31, 1964	12	07:22:02	13:25:50[c]	$06^h03^m48^s$	07:00:56	13:25:50	$06^h24^m54^s$

[a] Based on 5 deg elevation angle.

[b] Set occurs day after rise.

[c] Time of lunar impact.

Table 2. Ground commands sent to *Ranger VII* spacecraft by DSIF stations

Command[b]	Initiated, date/GMT	Verified,[a] GMT	Sent by DSIF station	Associated TLM event blips recorded at station
RTC-0	28/21:15:00	21:15:38	41	NA
RTC-0	28/21:16:00	21:16:38	41	NA
RTC-3	28/21:19:00	21:19:38	41	CHAN B-20 at 21:19:38
RTC-0	29/08:50:00	08:50:39	12	NA
RTC-0	29/08:52:00	08:52:39	12	NA
SC-1	29/08:54:00	08:54:40	12	CHAN B-20 at 08:54:41
SC-2	29/08:56:00	08:56:41	12	CHAN B-20 at 08:56:42
SC-3	29/08:58:00	08:58:41	12	CHAN B-20 at 08:58:42
RTC-0	29/09:36:00	09:36:38	12	NA
RTC-0	29/09:38:00	09:38:39	12	NA
RTC-3	29/09:40:00	09:40:39	12	CHAN B-20 at 09:40:41
RTC-4	29/10:00:00	10:00:38	12	CHAN B-20 at 10:00:40
RTC-0	29/11:21:00	11:21:38	12	NA
RTC-0	29/11:23:00	11:23:39	12	NA
RTC-3	29/11:25:00	11:25:39	12	CHAN B-20 at 11:25:43
RTC-0	31/11:15:30	11:16:08	12	NA
RTC-0	31/11:17:30	11:18:09	12	NA
SC-4	31/11:19:30	11:20:10	12	CHAN B-20 at 11:20:13
SC-5	31/11:21:30	11:22:10	12	CHAN B-20 at 11:22:12
SC-6	31/11:23:30	11:24:10	12	CHAN B-20 at 11:24:13
RTC-0	31/11:51:00	11:51:38	12	NA
RTC-0	31/11:53:00	11:53:39	12	NA
RTC-8	31/11:55:00	11:55:38	12	CHAN B-20 at 11:55:54
RTC-6	31/12:25:08	12:25:47	12	CHAN B-20 at 12:25:54

[a] Verified by ground station read-write-verify (RWV) system.

[b] The commands are defined as follows:

RTC-0 Clear spacecraft command subsystem

RTC-3 Antenna switchover

RTC-4 Initiate midcourse maneuver sequence

RTC-6 Initiate terminal maneuver sequence

RTC-8 Maneuver override (used prior to RTC-6 because no terminal maneuver was necessary but CC and S commands to the TV subsystem for both turn-on and switch to full power were desired).

SC-1 Midcourse maneuver roll duration

SC-2 Midcourse maneuver pitch duration

SC-3 Midcourse maneuver velocity increment

SC-4 Terminal maneuver first pitch duration

SC-5 Terminal maneuver yaw duration

SC-6 Terminal maneuver second pitch duration

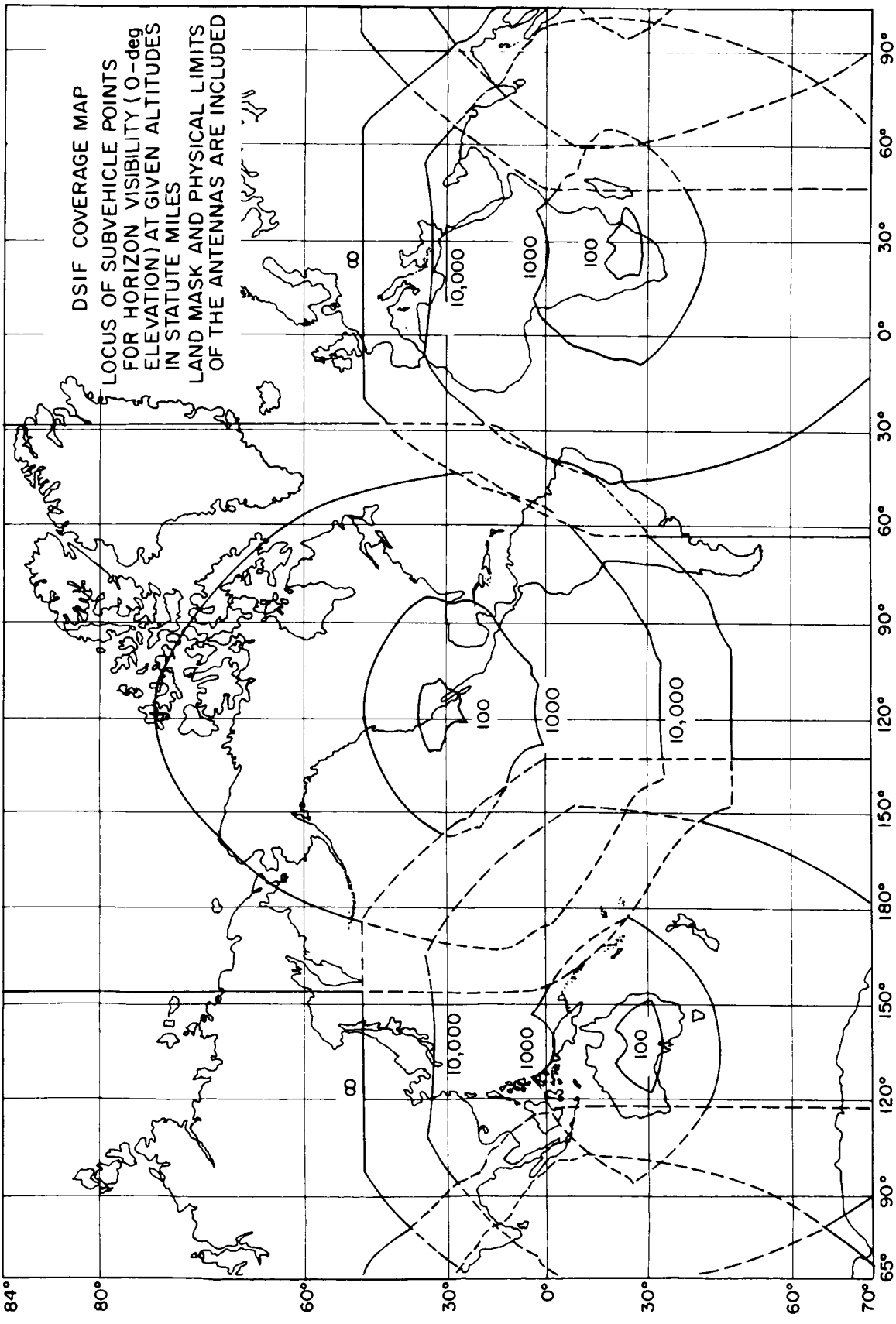

Fig. 1. DSIF coverage map

B. System Configuration

1. DSIF Stations

The DSIF consists of four permanent Deep Space Tracking Stations, a Launch Station, and a Mobile Tracking Station (MTS). The permanent stations are located at Goldstone, California (Stations 11 and 12); Woomera, Australia (Station 41); and Johannesburg, South Africa (Station 51). Each permanent station is equipped with an 85-ft-diameter, paraboloidal-reflector antenna. The Launch Station (Station 71) is located at Cape Kennedy, Florida and is equipped with a manually-operated, 6-ft-diameter antenna. The MTS (Station 59) is currently located near the Johannesburg Tracking Station and is equipped with a 10-ft-diameter, paraboloidal-reflector antenna; it is used for initial acquisition and tracking of the spacecraft. A map showing the coverage of the DSIF stations is presented in Fig. 1. Figures 2 through 7 are block diagrams of the stations. Table 3 presents a summary of DSIF capabilities and characteristics.

a. Goldstone Pioneer Station (Station 11). Station 11 (Fig. 2) was used as a backup facility during the mission. This station has a standard, phase-locked, 960-Mc receiver. A maser amplifier, a parametric amplifier (apex-mounted), and a horn feed are used to increase receiver sensitivity and reduce system noise temperature. Nonredundant ground support equipment is provided to record the TV subsystem video signal (Fig. 8) on magnetic tape. The antenna was positioned in accordance with data furnished from Station 12 via the intersite microwave link. No telemetry was available.

b. Goldstone Echo Station (Station 12). Station 12 (Fig. 3) was used as the prime communication station. A standard, phase-locked, 960-Mc receiver diplexed with a 200-w, 890-Mc transmitter provides both precision two-way doppler and spacecraft command capability. A 50-w backup RF amplifier is available for the transmitter. A maser amplifier, parametric amplifier (apex-mounted),

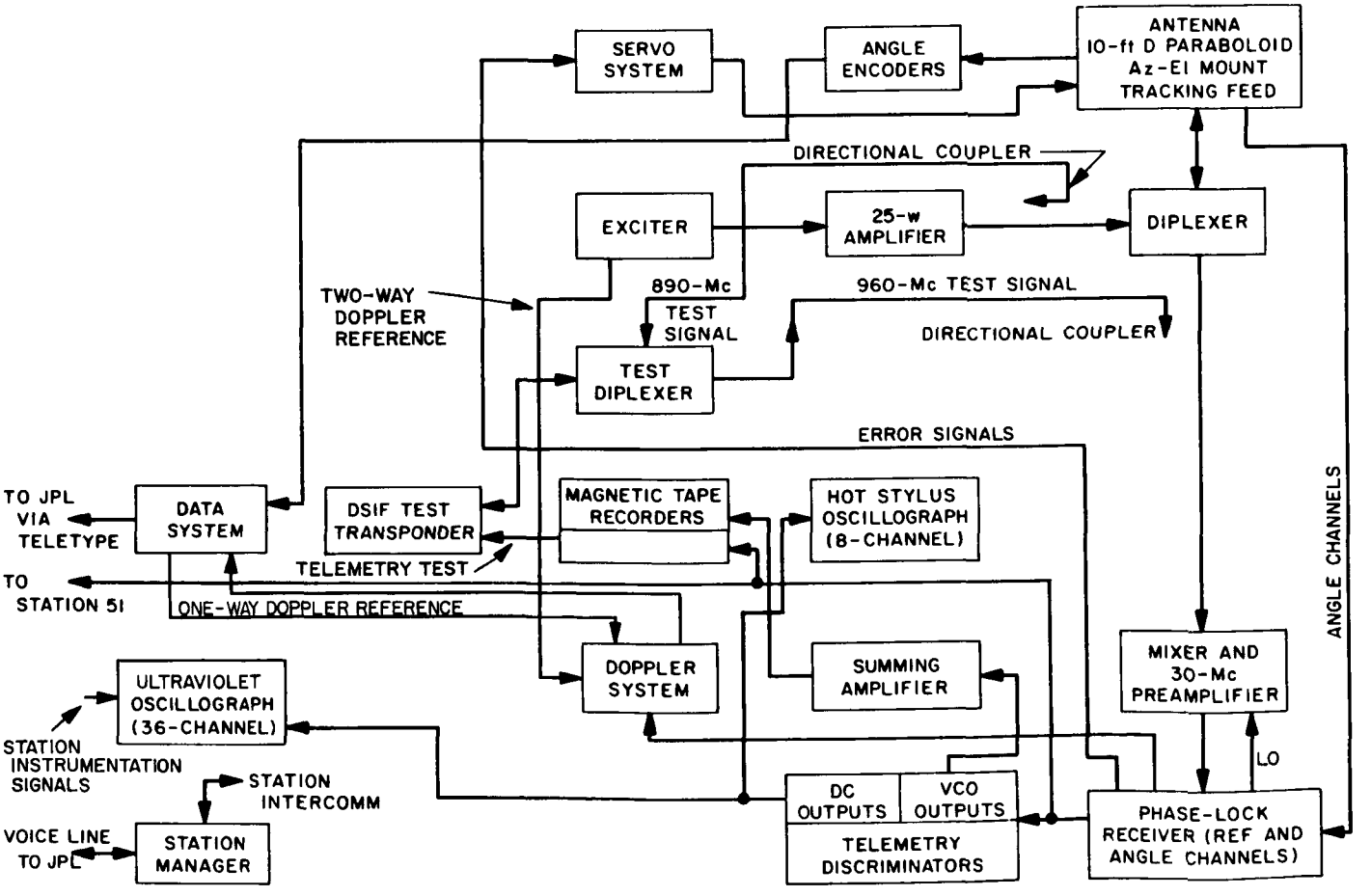

Fig. 2. Station 11 block diagram

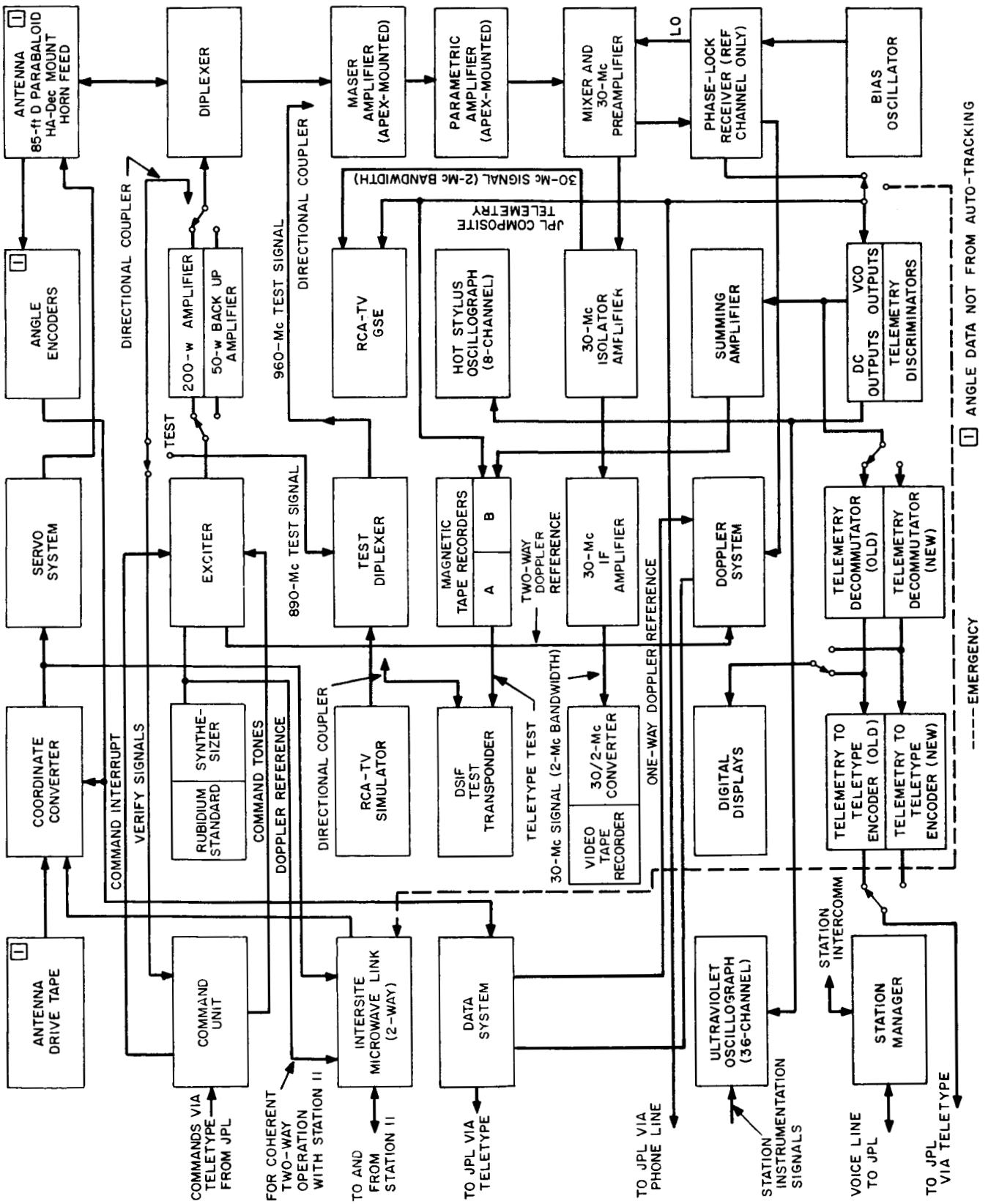

Fig. 3. Station 12 block diagram

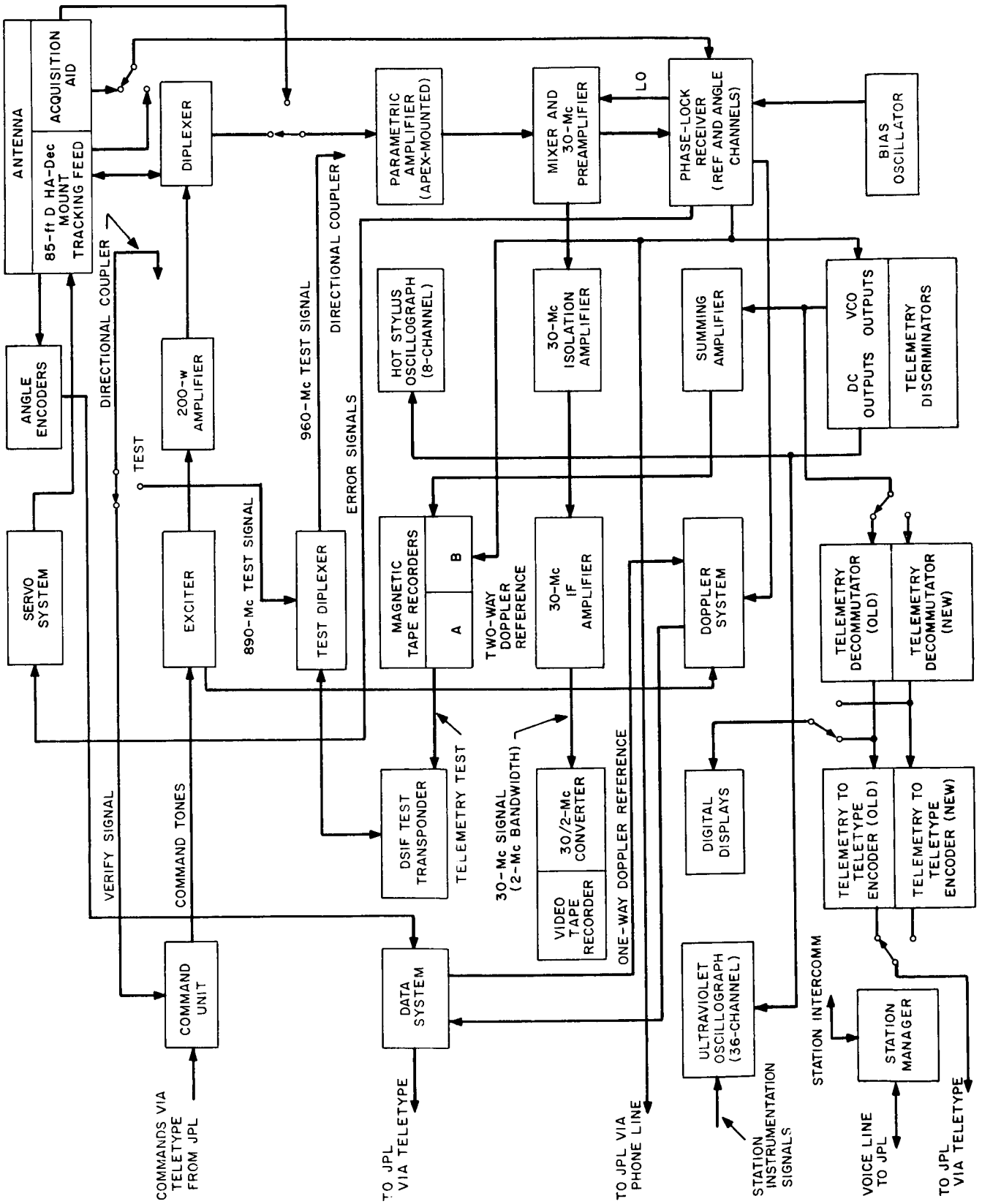

Fig. 4. Station 41 block diagram

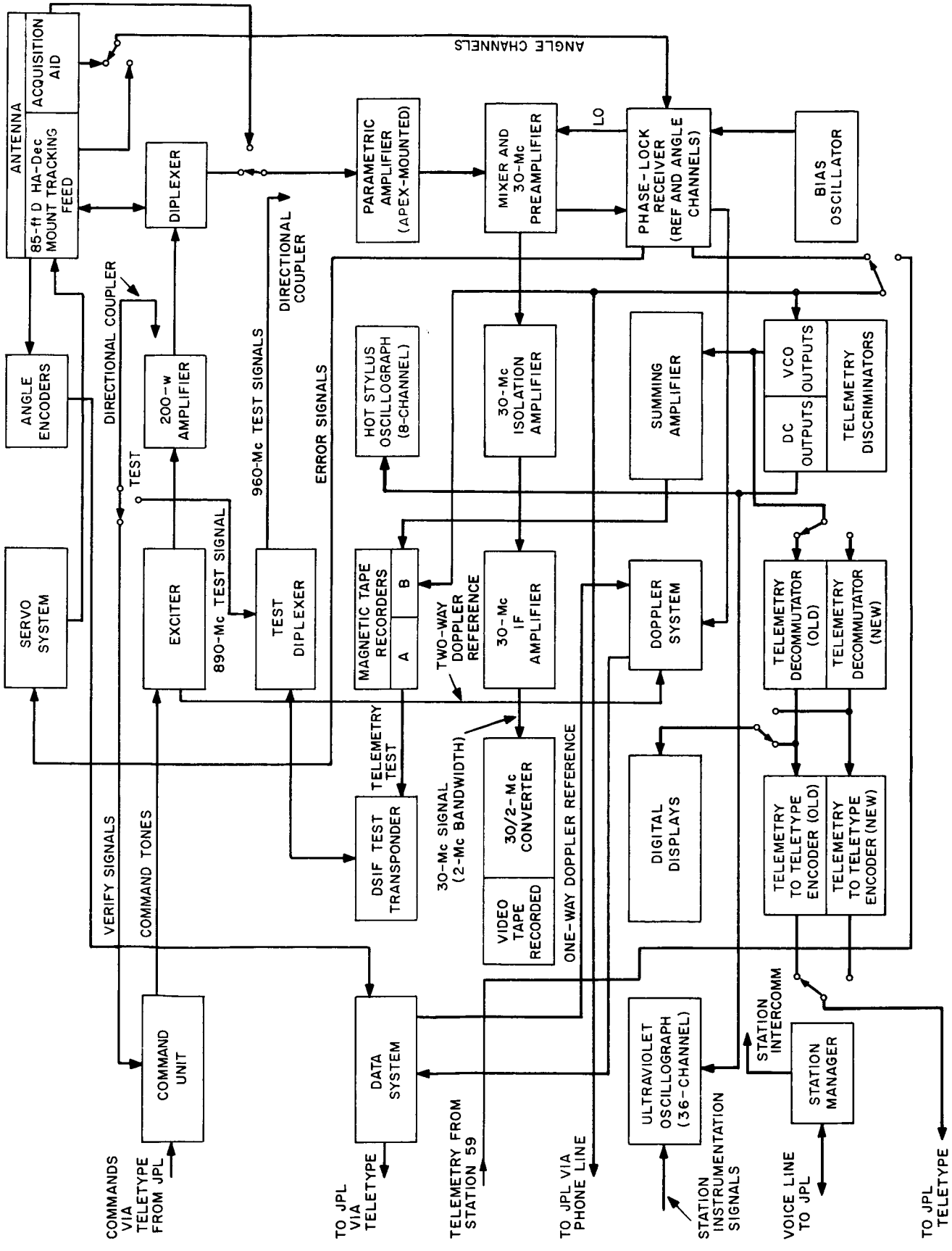

Fig. 5. Station 51 block diagram

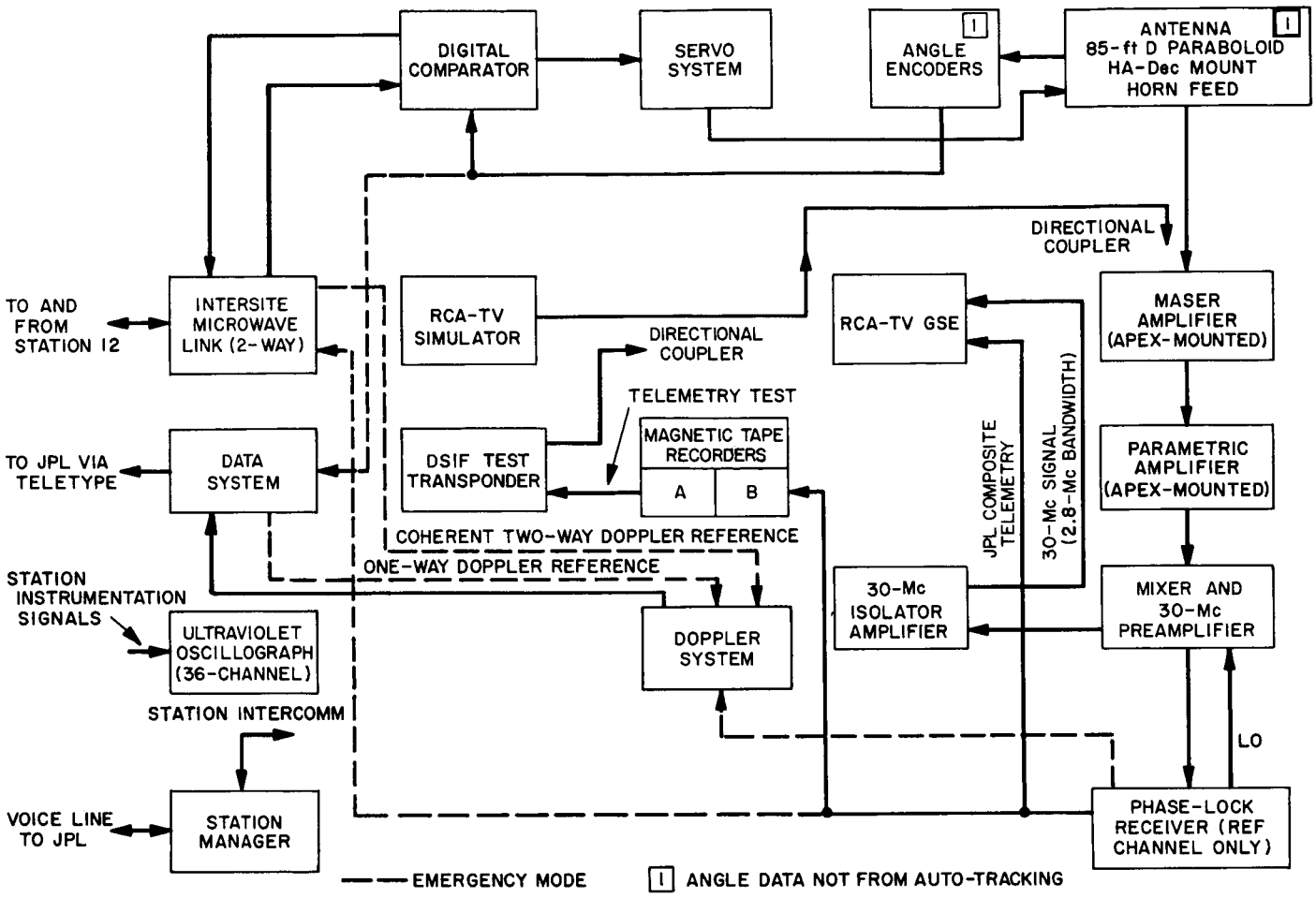

Fig. 6. Station 59 block diagram

and a horn feed are used to increase receiver sensitivity and reduce system noise temperature. An RWV unit is incorporated in the command system and allows readback and confirmation of transmitted commands. The primary function of this station during the mission was to track the transponder and record the pictures from the TV subsystem. Drive tapes were used to position the antenna. Equipment is available for encoding telemetric data in teletype format for transmission to the Jet Propulsion Laboratory (JPL) in near-real time. Real-time telemetry is transmitted to JPL via a commercial telephone circuit. Two-way doppler (using a rubidium standard) is transmitted to JPL in near-real time via teletype. Angle data were not taken as a result of autotrack operation.

c. Station 41. Station 41 (Fig. 4) has a standard, phase-locked, 960-Mc receiver diplexed with a 200-w transmitter to provide precision two-way doppler and spacecraft command capability. An RWV unit is incorporated in the command system to allow readback and confirmation of the transmitter commands. Equipment is available for encoding telemetry in teletype format for transmission to JPL in near-real time. Angle data and two-way doppler are transmitted to JPL in near-real time via teletype. A 30-Mc preamplifier, 30/2-Mc converter, and a wide-band tape recorder are used to provide predetection recording of TV signals in the event of a nonstandard mission.

d. Station 51. Station 51 (Fig. 5) has a standard, phase-locked 960-Mc receiver diplexed with a 200-w, 890-Mc transmitter to provide both precision two-way doppler and spacecraft command capability. An RWV unit is incorporated in the command system to allow readback and confirmation of the transmitted commands. Equipment is available for encoding telemetry in teletype format for transmission to JPL in near-real time. Angle data and two-way doppler are transmitted to JPL in near-real time via teletype. A 30-Mc preamplifier, 30/2-Mc converter, and a wide-band tape recorder are used to provide predetection recording of TV signals in the event of a nonstandard mission.

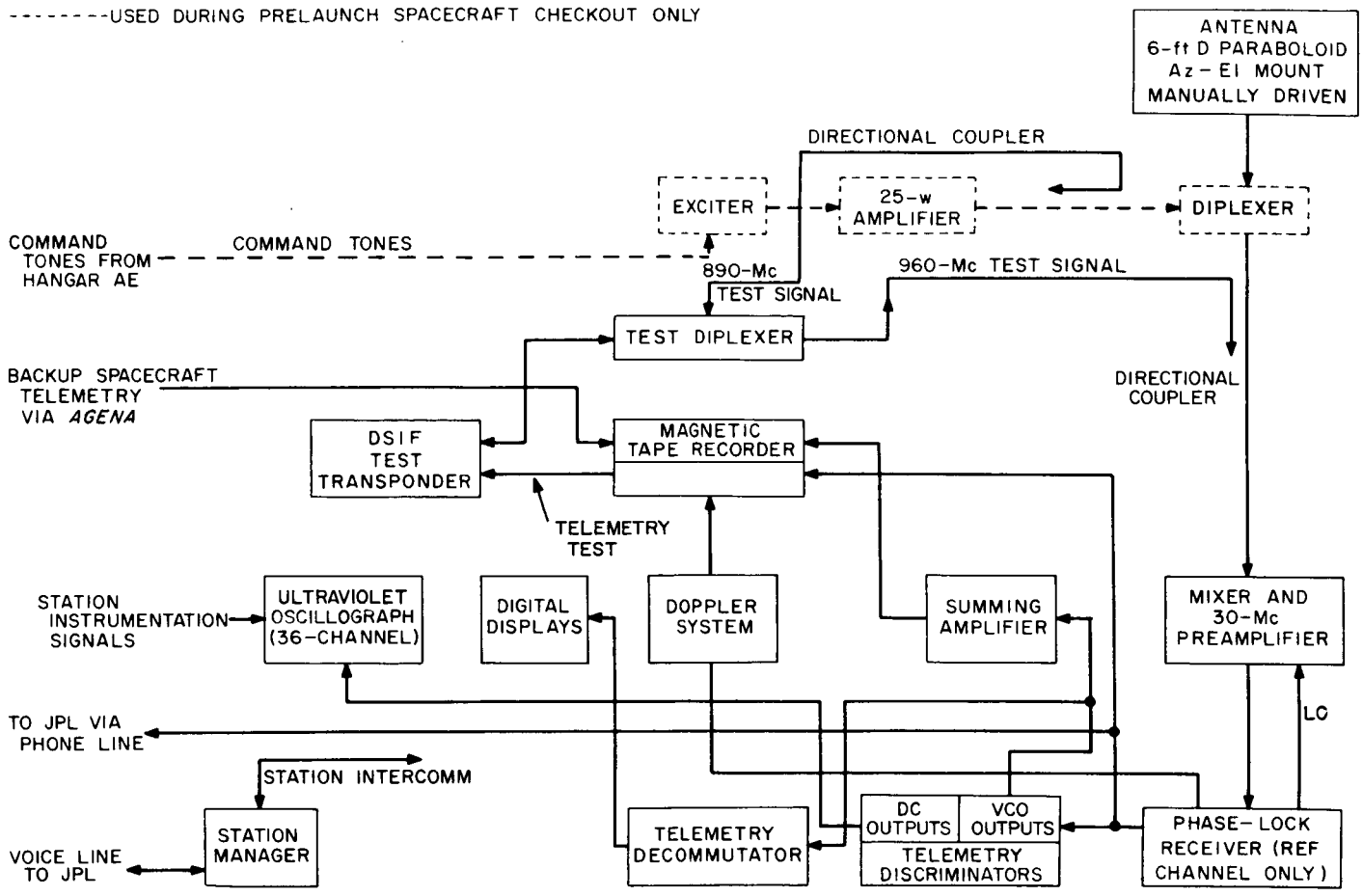

Fig. 7. Station 71 block diagram

e. Station 59. The MTS (Fig. 6) uses a standard, phase-locked, 960-Mc receiver diplexed with a 25-w transmitter, thus giving precision two-way doppler capability. This station's primary function was to provide angle data and two-way doppler during the injection phase of the flight when the angular rates were beyond the capabilities of the large antennas. Angle data and two-way doppler were transmitted to JPL in near-real time via teletype.

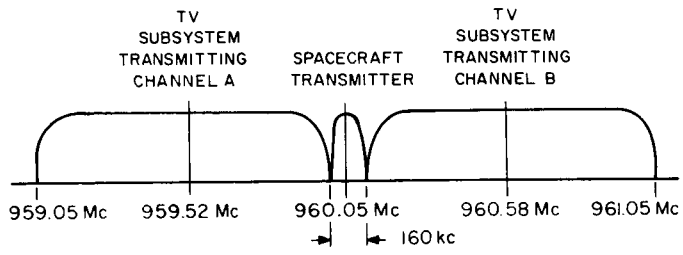

Fig. 8. *Ranger VII* TV subsystem frequency allocation

f. Station 71. This station (Fig. 7) has a standard, phase-locked, 960-Mc receiver diplexed with a 25-w transmitter to provide prelaunch checkout of the spacecraft. An RWV receiver is located at the station and is cabled to command system equipment in the spacecraft hangar to allow checkout of the spacecraft. The station is housed in two trailers; one trailer contains the receiver and command checkout systems and the other the instrumentation system that records the telemetry. Real-time telemetry is transmitted to JPL via a commercial telephone circuit. This station assists in checkout of the spacecraft prior to launch and tracks the spacecraft from launch to local horizon.

2. Ground Station Tracking Modes

Ground station tracking modes for *Ranger VII* are presented in Table 4.

3. Spacecraft Configuration

The RF communication system consists of a 3-w transponder-RF amplifier and an L band RF diplexer.

Table 3. DSIF capabilities and characteristics for *Ranger VII*

Parameter	Station 71	Station 59	Station 11	Station 12	Station 41	Station 51
1. Antenna size	6-foot (Az-El) (No angle data)	10-foot (Az-El)	85-foot polar (HA-Dec)	85-foot polar (HA-Dec)	85-foot polar (HA-Dec)	85-foot polar (HA-Dec)
2. Maximum angular rate	Manually operated	20 deg/sec in both axes	0.7 deg/sec in both axes	0.7 deg/sec in both axes	0.7 deg/sec in both axes	0.7 deg/sec in both axes
3. Antenna gain (960 Mc) Tracking feed Horn feed	— 20.5 db	23.5 ±0.2 db —	— 45.7 ±0.8 db	— 45.7 ±0.8 db	43.7 ±0.9 db —	43.7 ±0.9 db —
4. System noise temp in °K	1000 ±100	950 ±100	110 ±20	110 ±20	240 ±25	240 ±25
5. Transmitter power	—	25 w	—	200 w (50-w backup)	200 w	200 w
6. Data transmission a. Angles-doppler b. Telemetry	— Real time[a]	Near-real time None	Record TV Only	Near-real time[b] Near-real time Real time[a]	Near-real time Near-real time Real time[a]	Near-real time Near-real time Real time[a]
7. Decommutated telemetry	No	No	No	Yes	Yes	Yes
8. Command capability	No	No	No	Yes	Yes	Yes
9. Air freight time to JPL	2 days	7 days	1 day	1 day	7 days	7 days

[a]Sent to the telemetry processing station via wide-band telephone line.

[b]Angle data not the result of autotrack operation.

(See Fig. 9 for block diagram.) The 890/960-Mc transponder operates through either the pseudo-omnidirectional antenna or the directional high-gain paraboloidal antenna. The transponder system consists of an automatic phase tracking 890-Mc receiver and an integrally related 960-Mc transmitter. The nominal transmitter frequency is 960.05 Mc, with right hand circular polarization.

The 890-Mc receiver has the following characteristics:

Noise figure: 15 db

Loop noise bandwidth (at threshold): 100 cps

Dynamic range: 90 db

AGC loop bandwidth: 1 cps

Threshold: −139 dbm (at diplexer input)

It is a double superheterodyne, phase-locked receiver. The first IF is 50 Mc and the second IF is 10 Mc. The receiver AGC voltage and static loop phase error voltages are telemetered to the tracking ground stations as an aid in adjusting the transmitted 890-Mc frequency. The receiver is connected through an L band diplexer to the omnidirectional antenna. It is never switched to the high-gain antenna.

The transmitter portion of the transponder utilizes the receiver VCO as a frequency reference in the two-way transponder mode. In the one-way mode, an independent oscillator is switched into the circuit. The 250-mw output of the transponder is amplified to 3 w in each of the two RF amplifiers. One RF amplifier is coupled through a diplexer to the omnidirectional antenna; the other RF amplifier is coupled to the high-gain antenna through a

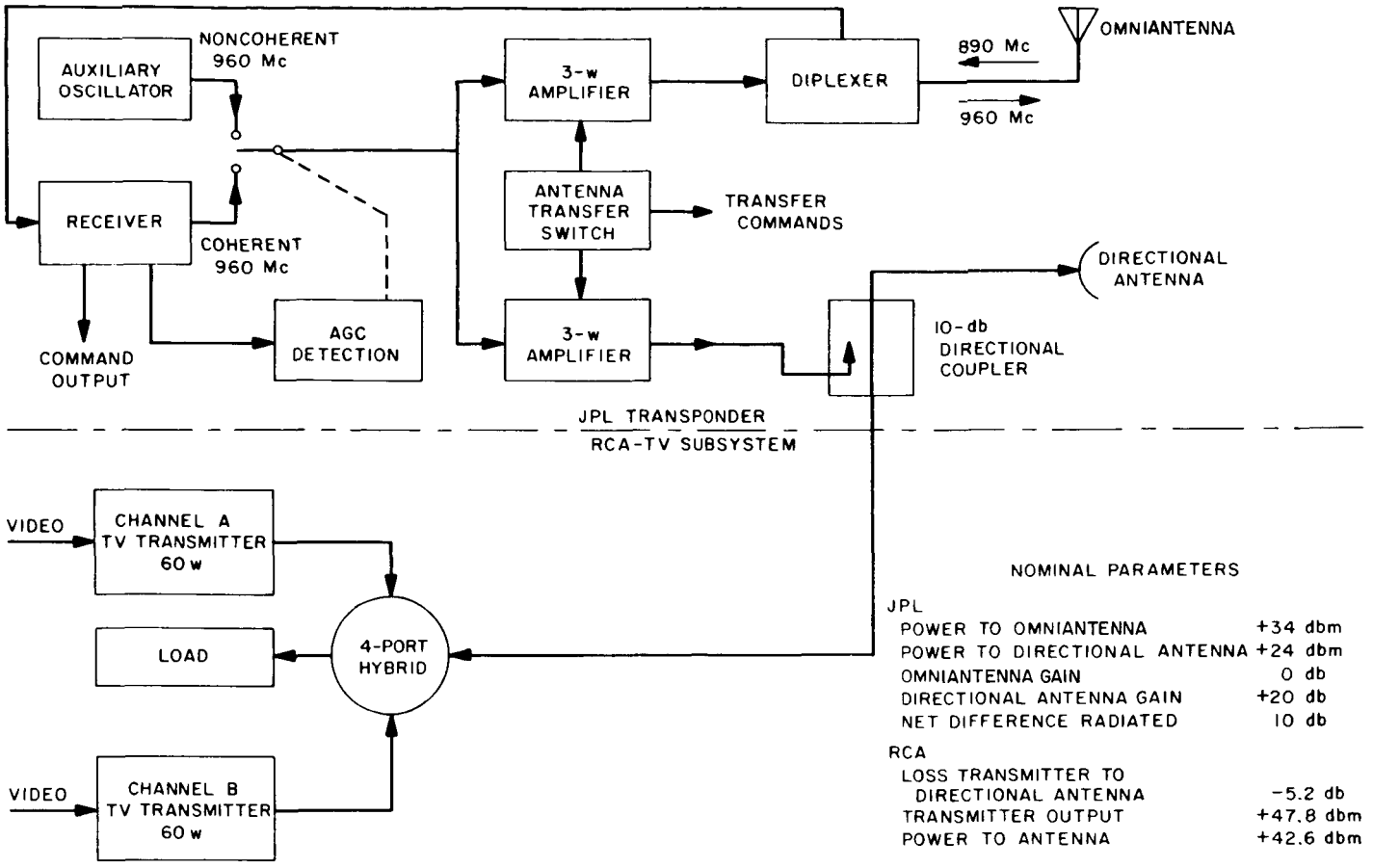

Fig. 9. Spacecraft communications system block diagram

10-db directional coupler which combines it with the RCA TV signal. The signal from either amplifier is sent to the respective antenna by switching its filament circuit on. The radiated output is approximately 3 w on the omniantenna and 0.3 w on the high-gain antenna. Figure 9 is a block diagram of the spacecraft's communication system.

4. Spacecraft Modes

The spacecraft modes are defined according to flight periods and are identified according to the telemetric system mode for that portion of the mission. Changes of the telemetric system mode are accomplished by the central computer and sequencer in the spacecraft or, in the event of a mode-change malfunction, by RTC-5. Indication of the telemetric mode will be provided by either the 3F6 measurement (decommutator address 66) or by the telemetry available. Table 5 gives the definition and indication of these modes.

C. *Data Evaluation*

In the ODP the *Ranger VII* spacecraft orbit is determined by finding that set of initial conditions which will cause the weighted sum of squares of the differences between actual observations and the computed values of the observables to be minimized. This method is referred to as modified weighted least squares, because of the method employed in obtaining the weights. In the usual least squares method, data points are weighted independently and inversely proportional to their expected (or measured) variances. In modified least squares, the independent weighting values are determined by the expected (or measured) effective variances. In arriving at the effective variance for each data type at each station, consideration is given to the correlation width of all recognized noise sources, the sampling rates, counting times, elevation angles, and range to the spacecraft. Prior to being put on the ODP input tape, the incoming data go through the tracking data editing program (TDEP) which rejects: gross blunder points, points that are out-

Table 4. Ground station tracking modes[a]

This mode description is used to define the station configuration. The code is broken into two parts. The first part defines the transmit/receive mode and the second part the antenna feed configuration.

Transmit/Receive[b]		Feed	
GM-0	No reception (transmit only)	0	Not Used
GM-1	One-way doppler (reception only)	1	Horn feed diplexer combination (85-ft reflector)
GM-2	Two-way, one-station (transmit/receive)	2	Tracking feed diplexer combination (85-ft reflector)
GM-3	Two-way, two-station noncoherent (reception only)	3	Acquisition antenna
GM-4	Two-way, two-station coherent (reception only with reference signal from transmitting station)	4	Dipole (6-ft reflector)
GM-5	Reception only (no doppler)	5	Horn feed, no diplexer (reception only) (85-ft reflector)

[a]Example: GM-2-1; transmitting to spacecraft and receiving two-way doppler; horn feed and diplexer.

[b]Telemetry will be available in all receiving modes except GM-0.

Table 5. Spacecraft mode definitions and indications

Mode	Flight period	Approximate duration	Telemetry subcarrier frequency, cps	Indication frequency tolerance, cps
TM-I	Launch to end of midcourse maneuver turns	16 hr	705	+8 −7
TM-II	Midcourse maneuver motor firing	7–17 min	722	±8
TM-III	Sun reacquisition to end of terminal maneuver	48 hr	739	±8
TM-IV	Postterminal maneuver to impact	26–33 min	756	±8

side of the antenna mechanical constraints, and points with bad teletypewriter format. No attempt is made to unscramble or correct bad format points. Hence, by sacrificing the possibility of utilizing the maximum number of data points there will be a reduction in the sensitivity to blunder points and possible error points that might otherwise introduce a significant error in the orbit. The current policy for weighting data is to assign an initial weight for each data type based on the sample rate, count time, and expected data quality. These weights may be changed when the sample rate and count time change or when the residuals indicate periods of extremely good or relatively poor tracking data.

Data evaluation techniques, consistent with the ODP computational methods, have been developed with the goal of isolating and removing systematic errors, and determining the characteristics of tracking data noise statistics, i.e., the RMS and mean values of the residuals. The pertinent equations used are given in the Appendixes. There are essentially two phases in the mission tracking evaluation: (1) inflight and (2) postflight.

In the inflight phase, station reports are analyzed to detect any unusual occurrence. Also, transmitter VCO drift statistics are compiled, frequency changes are noted and brought to the attention of the ODP group, and changes in transmitter assignment are evaluated. After the orbit is reasonably well known, observed values are checked against predicted values to determine validity of the tracking data and to detect blunder points before they influence the orbit. Certain parameters such as the doppler system figure of merit g^2 are computed and used to evaluate the quality of the incoming doppler data. Once the ODP listings are available, the residuals and rejected points are analyzed to detect systematic error sources. The test director is informed of all unusual occurrences, and if applicable, corrective action is recommended.

The postflight evaluation phase consists of analyzing all available data pertaining to the DSIF tracking performance. Complete analysis of all residuals, by data type, is made to detect equipment biases, periodic noise which might be attributed to station equipment, and any other systematic errors. The validity of the noise model is checked by a least-square fitting of the tracking data. All observations are evaluated and compared with preflight calibrations and past performance. All indications of equipment problems and nonstandard occurrences are investigated, and recommendations are made to the appropriate agencies. New data analysis techniques are investigated and implemented if applicable.

II. PERFORMANCE ANALYSIS

A. Preflight Calibrations

In order to improve the quality of the angular data to be used in the ODP, it is first corrected for the antenna optical pointing error (OPE). For the angle data stations, Stations 41 and 51, this error was determined from a series of independent, horizon-to-horizon star tracks. A polynomial curve fit was made to the differences between the refraction corrected ephemeris values and the observed values as read from the antenna angle encoders. The correction coefficients used in the *Ranger VII* in-flight orbit computations can be seen in Table 6.

Experience gained in past missions has shown that the OPE correction coefficients do not remove all systematic pointing errors. This is reasonable since the RF and optical axes of the antenna are not necessarily the same. That is, the RF axis is a function of the position of the quadripod feed, whereas the optical axis is not. Thus, if there is a quadripod deflection (due to thermal effect and/or gravitational loading) at some given instant of time, the optical error and the RF error would not be the same. Furthermore, the optical refraction and the RF refraction are not the same, due to the difference in respective wavelengths. In addition to these effects, the RF pointing error is also a function of feed alignment, received signal-to-noise ratio, and received polarization angle (since the antenna null pattern does not have the same slope at all polarization angles). RF boresight-vs-

Table 6. The systematic angular error coefficients for Stations 41 and 51

The useful range of these correction coefficients is for $-70° \leq \alpha \leq +70°$ and $-35° \leq \delta \leq +35°$, where α = HA and δ = Dec. The correction equations for $\Delta\alpha$ and $\Delta\delta$ are as follows:

$$\Delta\alpha = \sum_{i=0}^{3} \sum_{j=0}^{3} A_{ij}\, \alpha^i\, \delta^j$$

$$\Delta\delta = \sum_{i=0}^{3} \sum_{j=0}^{3} B_{ji}\, \alpha^i\, \delta^j$$

Station 41		Station 51	
$A_{00} = 8.0146025 \times 10^{-2}$	$B_{00} = 9.0860527 \times 10^{-2}$	$A_{00} = 2.7012712 \times 10^{-2}$	$B_{00} = 3.2645745 \times 10^{-3}$
$A_{01} = 5.45289422 \times 10^{-4}$	$B_{01} = 1.34214922 \times 10^{-4}$	$A_{01} = 1.58528433 \times 10^{-4}$	$B_{01} = 1.04434590 \times 10^{-4}$
$A_{02} = 2.48249580 \times 10^{-6}$	$B_{02} = -1.4110891 \times 10^{-5}$	$A_{02} = 6.24530962 \times 10^{-6}$	$B_{02} = 3.64955790 \times 10^{-6}$
$A_{03} = 2.24566914 \times 10^{-7}$	$B_{03} = 0.0$	$A_{03} = 3.43842729 \times 10^{-7}$	$B_{03} = 2.01838820 \times 10^{-7}$
$A_{10} = 6.4243077 \times 10^{-4}$	$B_{10} = -3.8345691 \times 10^{-4}$	$A_{10} = 4.1445643 \times 10^{-4}$	$B_{10} = -5.0429648 \times 10^{-5}$
$A_{11} = 8.69584098 \times 10^{-6}$	$B_{11} = 3.34771543 \times 10^{-6}$	$A_{11} = 9.3639950 \times 10^{-6}$	$B_{11} = 4.55037975 \times 10^{-6}$
$A_{12} = -6.52074417 \times 10^{-7}$	$B_{12} = 1.01895206 \times 10^{-7}$	$A_{12} = -3.41913978 \times 10^{-7}$	$B_{12} = -9.45727640 \times 10^{-8}$
$A_{13} = -1.59490382 \times 10^{-8}$	$B_{13} = 0.0$	$A_{13} = -3.76659061 \times 10^{-9}$	$B_{13} = -7.12650861 \times 10^{-9}$
$A_{20} = -3.3956128 \times 10^{-7}$	$B_{20} = -8.507846 \times 10^{-6}$	$A_{20} = 4.5531603 \times 10^{-7}$	$B_{20} = -7.9892838 \times 10^{-6}$
$A_{21} = -7.89511508 \times 10^{-8}$	$B_{21} = 4.53942058 \times 10^{-9}$	$A_{21} = -1.03537453 \times 10^{-8}$	$B_{21} = 5.89778738 \times 10^{-8}$
$A_{22} = -7.04116079 \times 10^{-9}$	$B_{22} = 2.09578021 \times 10^{-9}$	$A_{22} = -3.04187273 \times 10^{-9}$	$B_{22} = 3.62801844 \times 10^{-9}$
$A_{23} = -1.23595449 \times 10^{-10}$	$B_{23} = 0.0$	$A_{23} = -1.52367379 \times 10^{-11}$	$B_{23} = -5.16572982 \times 10^{-11}$
$A_{30} = -6.363126 \times 10^{-8}$	$B_{30} = -5.5657391 \times 10^{-9}$	$A_{30} = -1.3219781 \times 10^{-8}$	$B_{30} = -1.0465099 \times 10^{-8}$
$A_{31} = 1.90513748 \times 10^{-9}$	$B_{31} = 0.0$	$A_{31} = 6.22450846 \times 10^{-10}$	$B_{31} = 0.0$
$A_{32} = 3.95248319 \times 10^{-10}$	$B_{32} = 0.0$	$A_{32} = 1.79924034 \times 10^{-10}$	$B_{32} = 0.0$
$A_{33} = 9.57751208 \times 10^{-12}$	$B_{33} = 0.0$	$A_{33} = 3.31402952 \times 10^{-12}$	$B_{33} = 0.0$

polarization angle tests were conceived as an attempt to study these RF errors. The test was designed to correlate the optical and RF errors observed at the collimation tower over a range of signal levels and polarization angles. Unfortunately, experience has shown that the results of these tests cannot be applied to the inflight data in a meaningful manner. Hence, for the purpose of describing the RF pointing error the test is inadequate, and a new method for determining the RF antenna calibration is required. However, the tests are useful in that they add to the composite of statistical data, and they are an excellent indication of RF system status and autotrack capability. Finally, the OPE correction coefficients are even less adequate in describing pointing errors for *Ranger VII* because recent L-S band conversion work at Stations 41 and 51 has changed the intrinsic antenna characteristics and has thus changed the antenna optical pointing error.

Preflight calibration star tracks are used to: (1) detect gross system errors and (2) test the validity of the optical pointing error correction coefficients.

The following preflight calibration tests, consisting of RF boresight-vs-polarization angle tests and star tracks, were made by the DSIF stations for *Ranger VII*.

Table 7. Boresight-vs-polarization angle test; Station 59; July 20, 1964

Polarization angle, deg	$\bar{x}(\alpha)^a$	$\bar{x}(\delta)^b$	$\sigma(\alpha)^c$	$\sigma(\delta)^d$	Signal level, dbm
0	−0.06036	0.12786	0.00318	0.00294	−120
90	−0.07385	−0.07223	0.00373	0.00490	
180	0.08087	0.10004	0.00287	0.00332	
270	−0.10614	−0.20707	0.0080003	0.00489	
0	−0.10031	0.13381	0.00508	0.00317	−130
90	−0.11443	−0.07053	0.00701	0.00829	
180	0.03785	0.10193	0.01229	0.00886	
270	−0.16834	−0.22834	0.00828	0.02450	

[a] Mean value of residuals in HA.
[b] Mean value of residuals in Dec.
[c] Standard deviations of residuals in HA.
[d] Standard deviations of residuals in Dec.

1. Station 59

A boresight-vs-polarization angle test was performed July 20, 1964. The results were satisfactory and can be seen in Table 7.

2. Station 51

Boresight-vs-polarization angle tests were conducted July 12 and 13, 1964. The results were satisfactory and can be seen in Table 8. Star tracks of Eta Ophiuchus, Epsilon Bootes, and Alpha Ceti were performed July 9 and 10, 13, and 14, respectively (Fig. 10–12). As can be seen, the OPE correction coefficients are reasonably satisfactory at a declination (Dec) of 3.95 deg (Alpha Ceti) but quite inadequate at greater or lesser (Eta Ophiuchus, 344.3 deg and Epsilon Bootes, 27.22 deg) declinations. As previously mentioned, this inadequacy is due in a large part to L-S band conversion work.

3. Station 41

A boresight-vs-polarization angle test was conducted July 18, 1964. The results (Table 9) were satisfactory.

Table 8. Boresight-vs-polarization angle test; Station 51; July 12-13, 1964

Polarization angle, deg	$\bar{x}(\alpha)^a$	$\bar{x}(\delta)^b$	$\sigma(\alpha)^c$	$\sigma(\delta)^d$	Signal level, dbm
0	0.00759	0.19185	0.00602	0.00302	−120
90	−0.03977	−0.09756	0.00455	0.00272	
180	0.13308	0.15759	0.00542	0.00330	
270	−0.09681	−0.20063	0.00668	0.00363	
0	−0.00273	0.18414	0.01846	0.00529	−130
90	−0.04432	−0.09953	0.01172	0.01531	
180	0.13144	0.15434	0.01306	0.00761	
270	−0.09452	−0.20796	0.01094	0.00905	
0	0.06842	0.01263	0.02851	0.02173	−140
90	0.05950	0.04666	0.02819	0.01704	
180	0.04437	0.03078	0.02725	0.01636	
270	0.07810	0.01678	0.02442	0.02114	

[a] Mean value of residuals in HA.
[b] Mean value of residuals in Dec.
[c] Standard deviations of residuals in HA.
[d] Standard deviations of residuals in Dec.

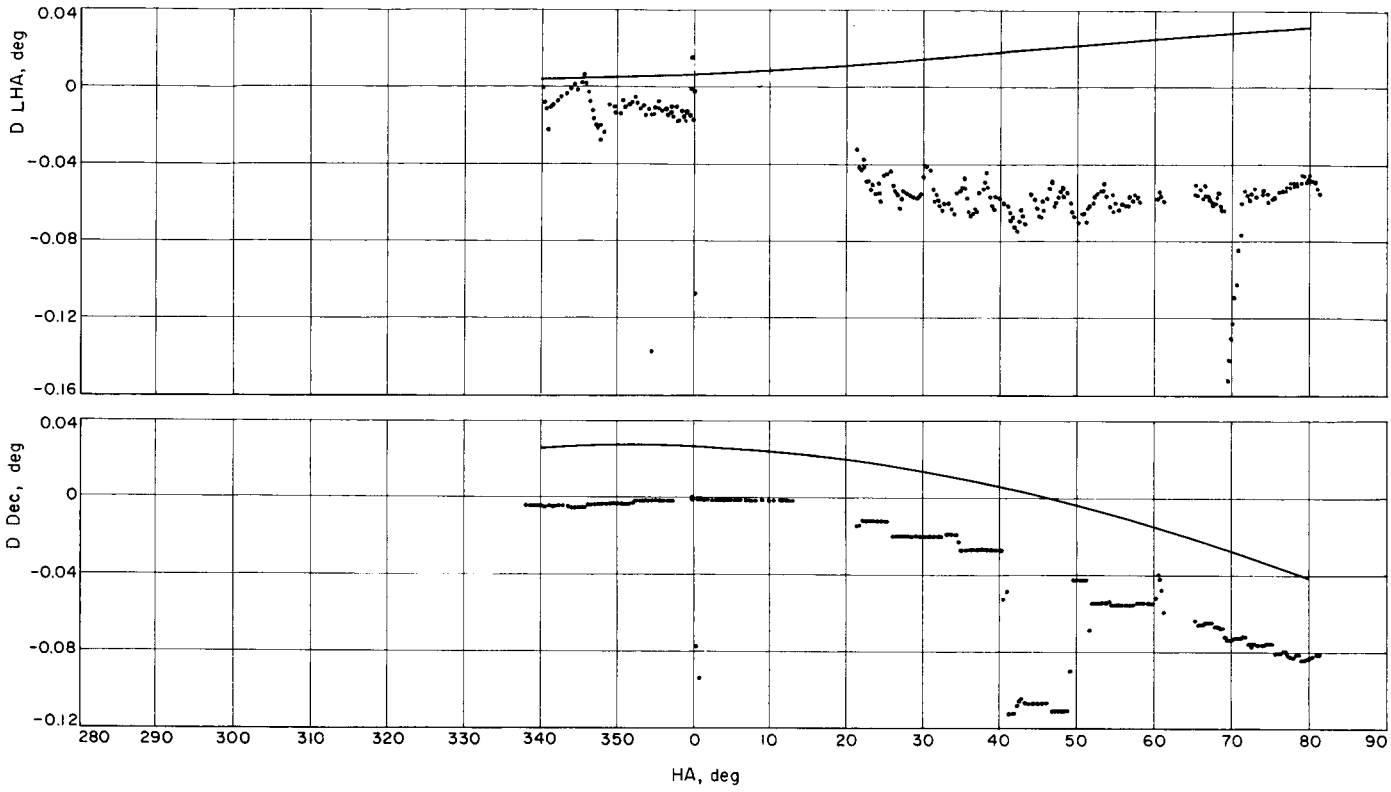

Fig. 10. Station 51 Eta Ophiuchus July 9 and 10, 1964 (Dec 344.39 deg)

Table 9. Boresight-vs-polarization angle test; Station 41; July 18, 1964

Polarization angle, deg	$\bar{x}(\alpha)$[a]	$\bar{x}(\delta)$[b]	$\sigma(\alpha)$[c]	$\sigma(\delta)$[d]	Signal level, dbm	Polarization angle, deg	$\bar{x}(\alpha)$[a]	$\bar{x}(\delta)$[b]	$\sigma(\alpha)$[c]	$\sigma(\delta)$[d]	Signal level, dbm
0	−0.00542	0.00427	0.00393	0.01253	−100	180	−0.00092	−0.00585	0.00640	0.00426	
90	0.00082	−0.00914	0.00282	0.00194		270	0.01512	−0.00893	0.00495	0.00516	
180	−0.02221	0.00693	0.00099	0.00038		0	−0.01106	0.00477	0.01025	0.00480	−130
270	−0.00143	0.00421	0.00171	0.00157		90	0.00357	−0.00662	0.00843	0.00509	
0	−0.01423	0.00168	0.01187	0.00878	−110	180	−0.01425	−0.00328	0.01225	0.00502	
90	0.00281	−0.00943	0.00249	0.00150		270	0.02494	−0.01482	0.00790	0.00521	
180	−0.01617	0.00465	0.00495	0.00208		0	−0.05009	0.02722	0.02331	0.00693	−140
270	−0.00609	0.00752	0.00215	0.00236		90	−0.03297	0.01384	0.01753	0.01274	
0	−0.02191	0.00893	0.00653	0.00368	−120	180	0.01977	−0.01474	0.02983	0.01464	
90	−0.00921	−0.00266	0.00522	0.00568		270	0.04716	−0.02028	0.02024	0.01338	

[a] Mean value of residuals in HA.

[b] Mean value of residuals in Dec.

[c] Standard deviations of residuals in HA.

[d] Standard deviations of residuals in Dec.

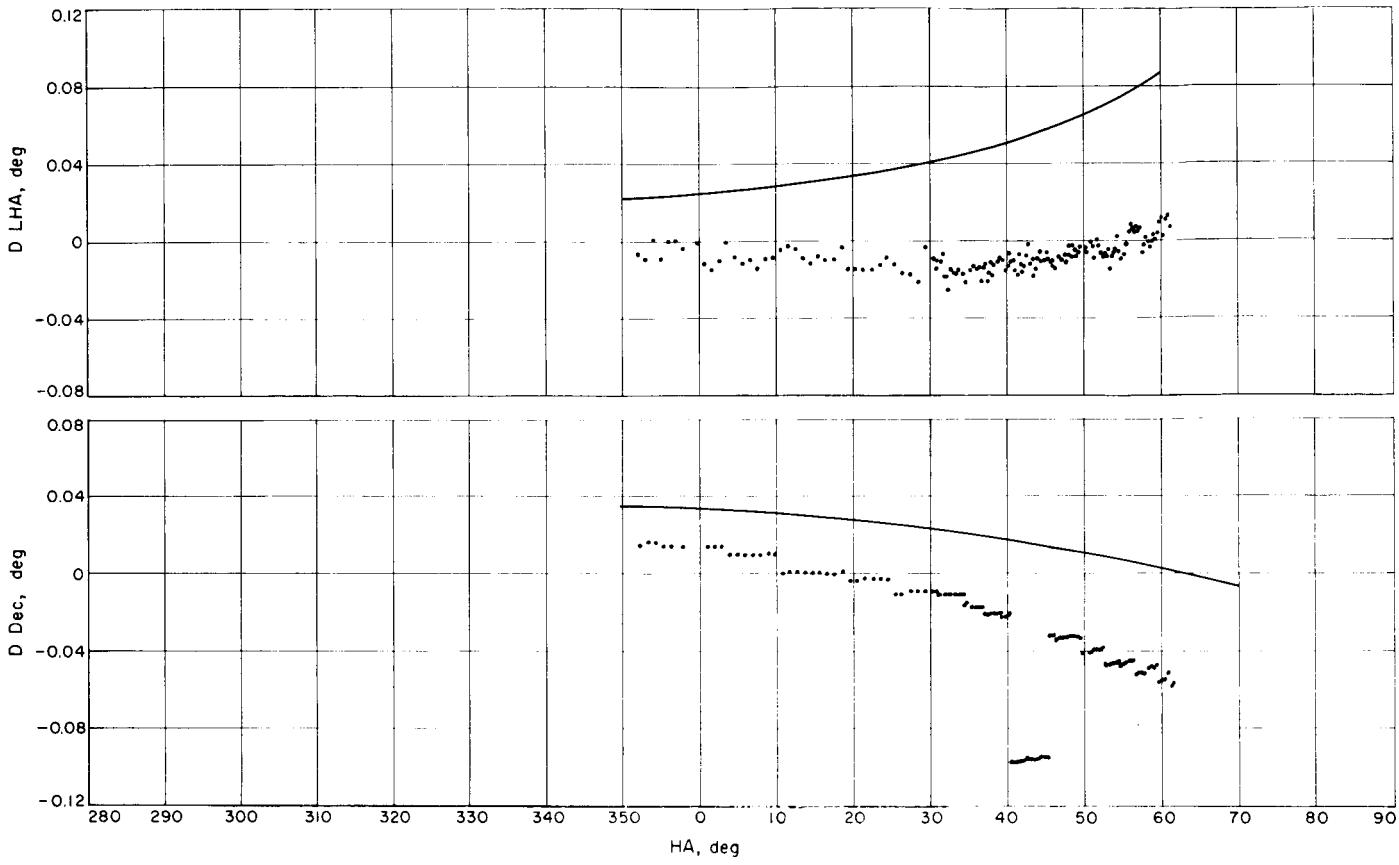

Fig. 11. Station 51 Epsilon Bootes July 13, 1964 (Dec 27.22 deg)

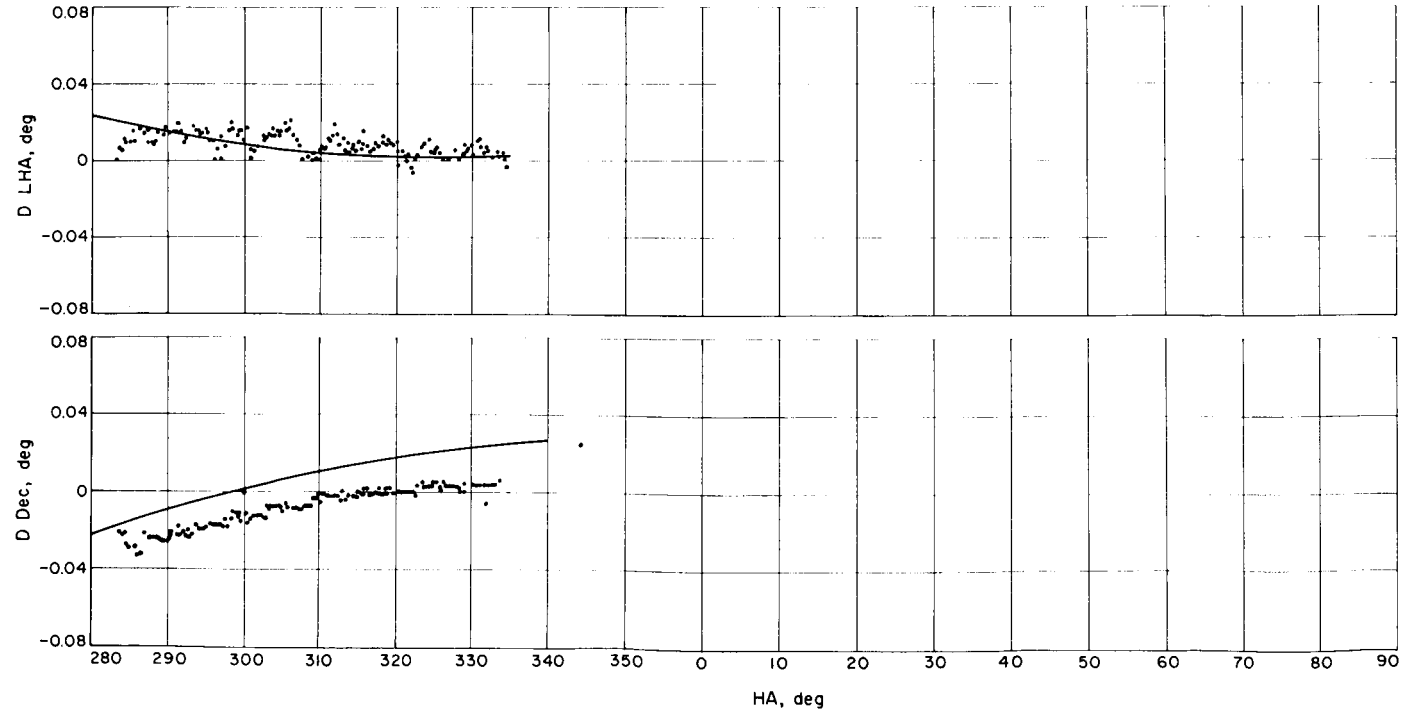

Fig. 12. Station 51 Alpha Ceti July 14, 1964 (Dec 3.95 deg)

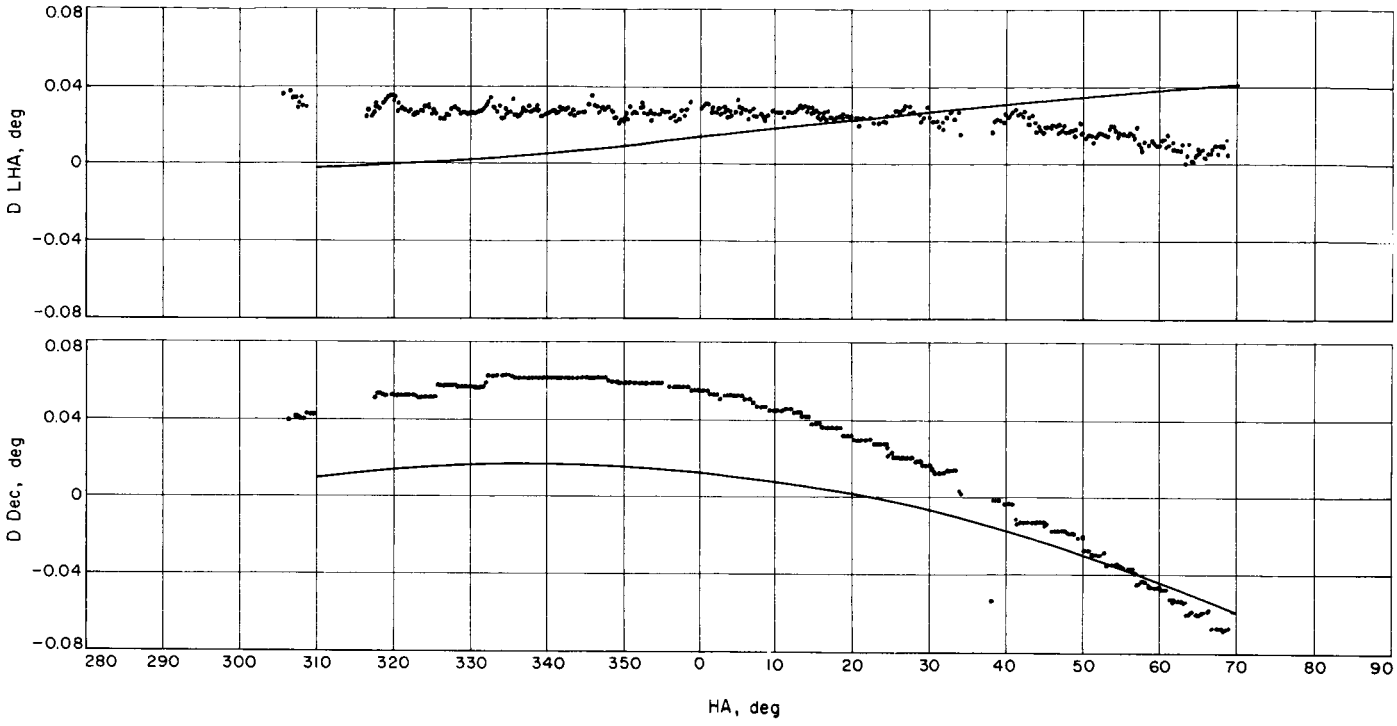

Fig. 13. Station 41 Alpha Aquila June 19, 1964 (Dec 8.7 deg)

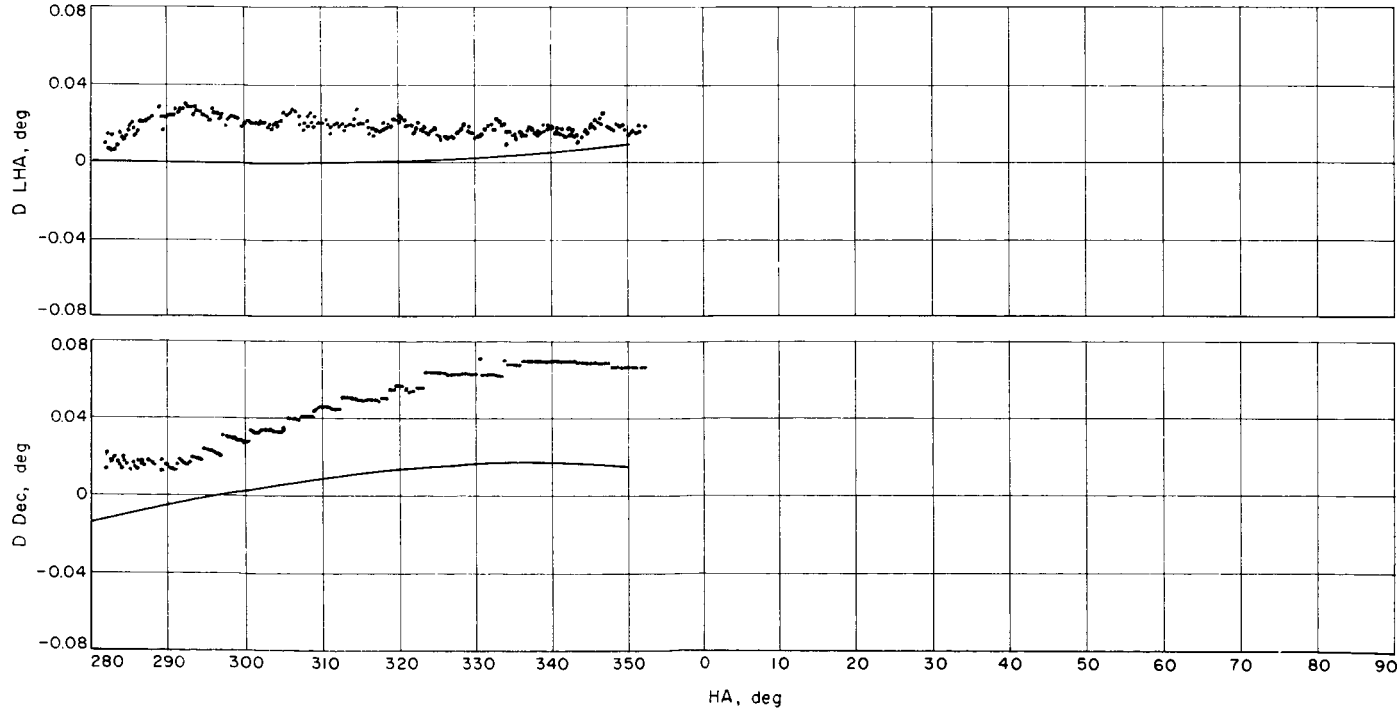

Fig. 14. Station 41 Alpha Aquila June 24, 1964 (Dec 8.7 deg)

Star tracks of Alpha Aquila (8.7 deg Dec) were conducted June 19 and 24 and are shown in Fig. 13–14. Apparently, there is a moderate error in local hour angle and a substantial error in declination. Once again, this failure in the OPE correction coefficients can be attributed in part to the L-S band conversion at this station.

B. Postflight Analysis of Station Performance During the Mission

The DSIF stations tracked *Ranger VII* continuously from acquisition by Station 59 until impact. In general the quality of the tracking data was extremely good. A summary of the data used in the orbit determination computations, together with the data statistics, can be found in Table 10. The relative quality of the tracking data taken during each pass can be obtained by comparing the statistics listed in the table.

Appendix A contains listings of the station transmitter VCO frequencies. Appendix B contains all the residual (observed minus computed) plots from the ODP, while Appendix C contains an hourly trajectory printout.

Table 10. Summary of data used in the final *Ranger VII* orbit determination

Station	Data type	Sample time	Date/GMT		Points used	Standard deviation, cps	Root mean square, cps	Mean, cps
			Start	End				
Premidcourse								
59	CC3	5	28/17:22:38	28/17:23:03	5	0.1980	0.1980	−0.0090
51	CC3	60	28/21:53:32	29/07:06:32	428	0.0100	0.0101	0.0003
41	CC3	60	28/17:53:32	28/23:59:32	252	0.0100	0.0100	0.0003
	CC3	60	29/00:00:32	29/00:05:32	6	0.0059	0.0065	−0.0026
12	CC3	60	29/07:11:32	29/08:11:32	61	0.0079	0.0080	0.0011
	CC3	60	29/08:12:32	29/08:34:32	23	0.0104	0.0108	−0.0028
	CC3	60	29/08:41:32	29/09:58:32	74	0.0141	0.0142	0.0015
Postmidcourse								
51	CC3	60	30/01:52:32	30/06:46:32	256	0.0140	0.0141	−0.0017
	CC3	60	30/23:44:32	31/07:14:32	357	0.0156	0.0158	−0.0028
41	CC3	60	29/18:46:32	30/00:23:32	290	0.0170	0.0172	0.0025
	CC3	60	30/00:24:32	30/01:40:32	61	0.0151	0.0154	−0.0027
	CC3	60	30/19:01:32	30/23:33:32	224	0.0183	0.0183	0.0015
12	CC3	60	29/10:41:32	29/11:27:32	31	0.0116	0.0116	−0.0008
	CC3	60	29/11:31:32	29/17:50:32	341	0.0085	0.0086	0.0011
	CC3	60	29/17:51:32	29/18:41:32	42	0.0095	0.0159	−0.0127
	CC3	60	30/07:18:32	30/08:22:32	62	0.0104	0.0111	0.0037
	CC3	60	30/08:23:32	30/17:56:32	564	0.0089	0.0090	−0.0001
	CC3	60	30/17:57:32	30/18:57:32	61	0.0093	0.0097	−0.0024
	CC3	60	31/07:34:32	31/08:19:32	46	0.0096	0.0100	0.0028
	CC3	60	31/08:20:32	31/10:58:32	151	0.0088	0.0088	0.0001
	CC3	60	31/11:02:32	31/12:24:32	74	0.0334	0.0342	−0.0077
	CC3	10	31/12:25:23	31/13:25:43	296	0.1240	0.1240	−0.0006

The angular data show, as do the preflight star tracks, that OPE correction coefficients used in the ODP to describe the antenna pointing error are not adequate. Large biases and large standard deviations are seen in both hour angle and declination. A better set of correction coefficients or a better method of antenna calibration is desirable for future missions.

The doppler tracking data were excellent except for the launch pass at Stations 51 and 59, which are covered in detail later. After Station 41 acquired the spacecraft during the first pass, practically no good data were lost during the remainder of the flight.

The following is a station-by-station analysis of the tracking performance during the mission. It is based on all available data such as real time tracking data, inflight station reports, station logs, calibration records, etc. All times listed refer to GMT.

1. Station 59

a. Launch Pass. Acquisition occurred at 17:20:50 July 28, 1964. The antenna servo system was put in the autotrack mode at 17:21:00 but was taken out of autotrack at 17:21:39 because the antenna was being thrown out by the stop relay. The station then attempted to follow nominal predictions but was unable to locate the main beam until 17:32:36 from which time it tracked the spacecraft until the end of the pass at 17:37:53. Figures 15–17 show the actual antenna pointing angles vs the predicted antenna pointing angles and the actual transmitter VCO frequency vs the predicted transmitter VCO frequency. As can be seen by these graphs the station was not able to effectively follow the predictions from 17:21:39 until 17:32:36. This problem on the part of the operators is at least partially due to the high angular rates encountered during this portion of the mission. During this pass only 5 pts of 5 sec two-way doppler samples were usable in the ODP. The residuals of these doppler samples are seen in Fig. B-1 through B-4.

2. Station 51

a. Launch Pass. Acquisition occurred at 17:21:38, July 28. The antenna servo system was put in autotrack at 17:21:53, and the spacecraft was acquired in the main beam 3 sec later. However, at 17:22:20 the receiver went out of lock, and continuous lock was not achieved for the remainder of the pass, which terminated with loss of signal at 17:32:55. At 17:28:07 the transmitter was switched on in an attempt to take the spacecraft from Station 59. At this time Station 51 (as well as Station 59) indicated certain data were good with their data condition code, when in fact they were unusable, as illustrated by the fact that during the period from 17:28:41 to 17:29:06 both Stations 51 and 59 reported good two-way doppler data, an impossibility. During this pass no two-way doppler samples were usable in the ODP. Residuals appear in Fig. B-5.

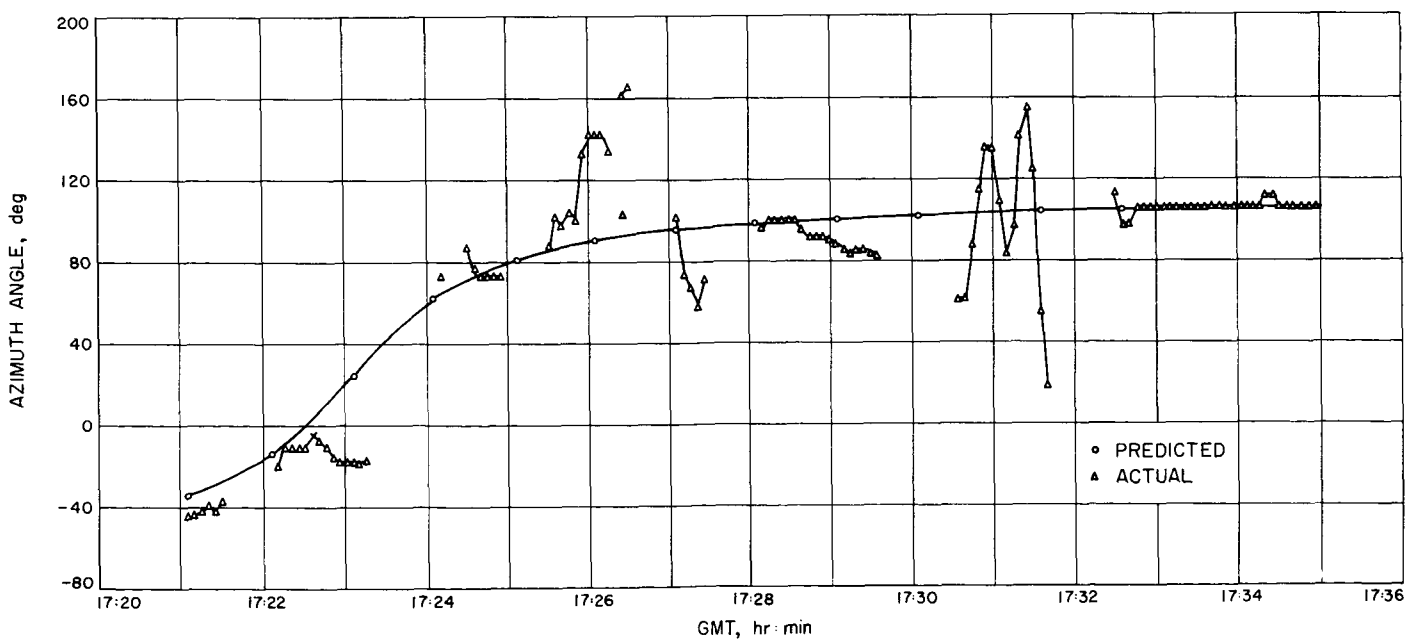

Fig. 15. Station 59 predicted vs actual azimuth angles (July 28, 1964)

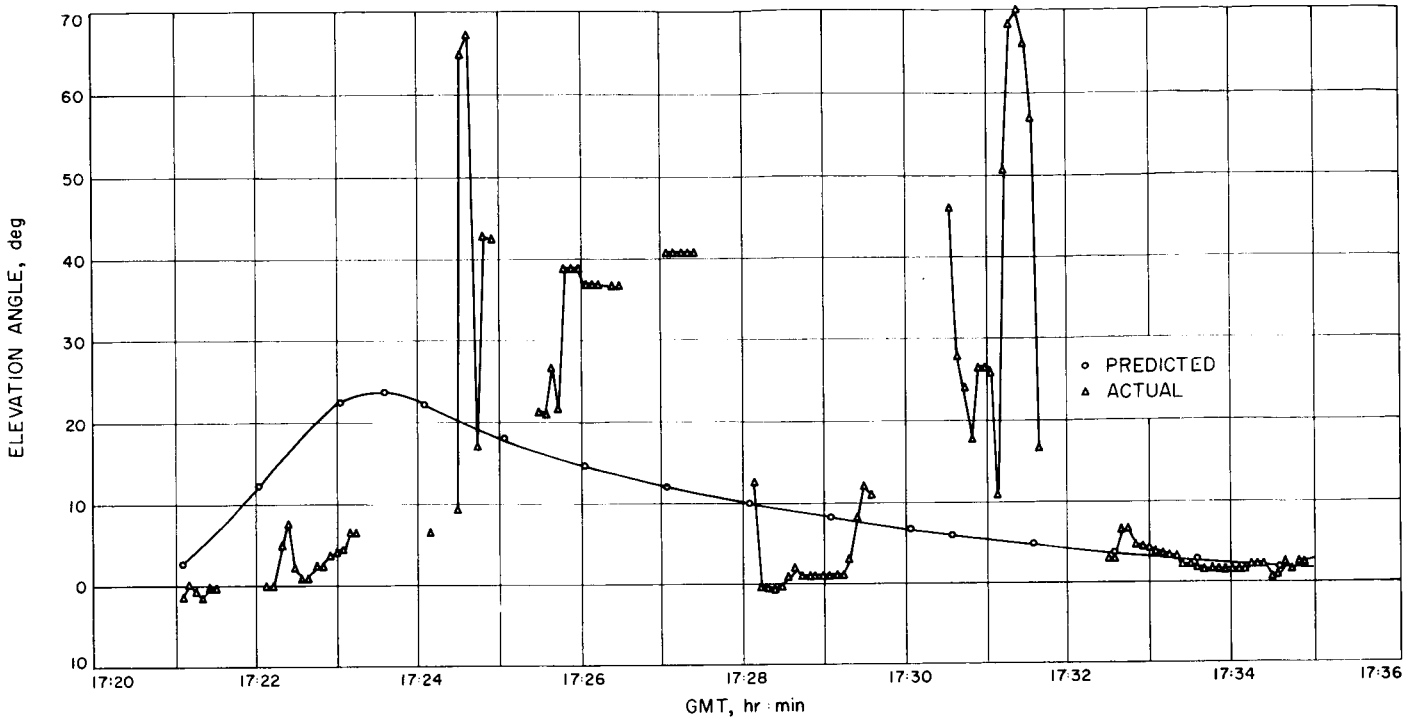

Fig. 16. Station 59 predicted vs actual elevation angles (July 28, 1964)

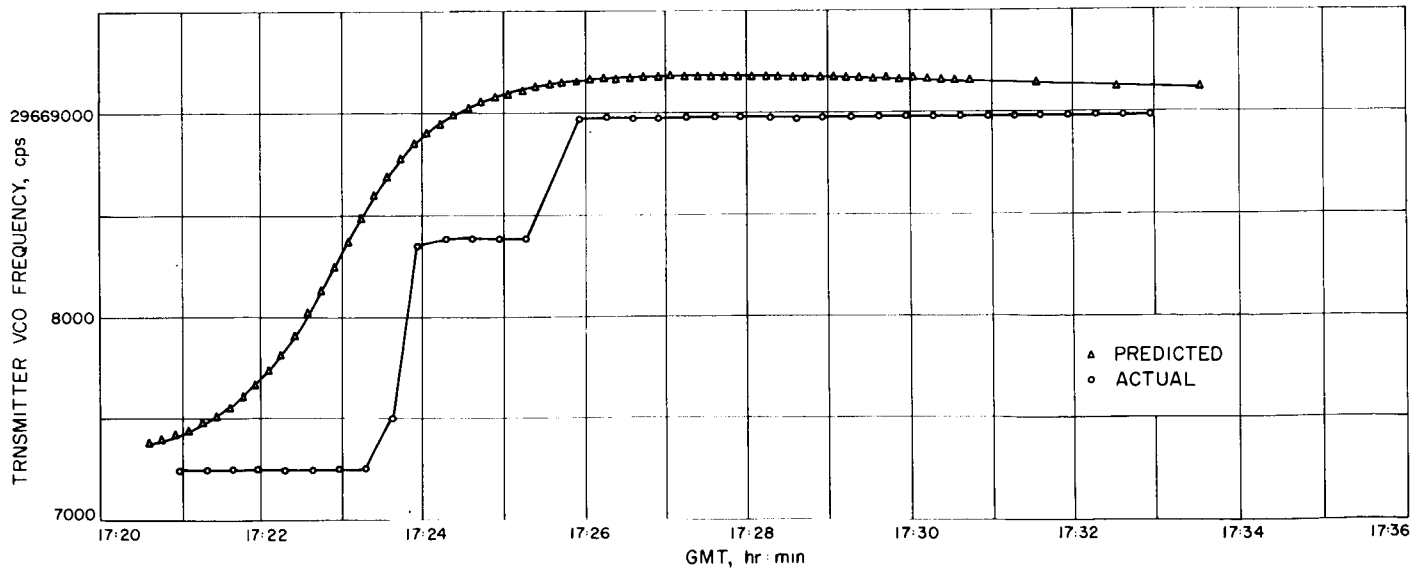

Fig. 17. Station 59 predicted vs actual transmitter VCO frequencies (July 28, 1964)

b. Pass No. 1. Acquisition occurred at 20:45:50, July 28. Two-way lock was confirmed at 21:51:03. A transfer in the transmitting assignment to Station 41 was effected at 23:07:52, with Station 51 regaining the transmitting assignment at 00:01:02, July 29. Very good two-way doppler was recorded during the entire span of this pass.

Angle data recorded were not of very high quality for reasons mentioned in the preflight calibrations section. Declination angle data indicated a bias of +0.03 deg while hour angle data indicated a rather high standard deviation of +0.03 deg. The residuals for this pass are presented in Fig. B-6 through B-9. The transmitter was turned off at 07:08:00, and loss of signal was recorded at 08:54:29.

c. Pass No. 2. Acquisition occurred at 22:02:45, July 29. The transmitter was turned on at 01:45:36, July 30, and very good two-way doppler was recorded until the transmitter was turned off at 07:12:20. Declination angle data indicated a bias of +0.03 deg while hour angle data showed a standard deviation of +0.03 deg. The residuals for this pass can be seen in Fig. B-10 through B-13. The end of the pass occurred with loss of signal at 09:12:03.

d. Pass No. 3. Acquisition occurred at 22:13:17, July 30. The transmitter was turned on at 23:40:00. The two-way doppler recorded during this pass was reasonably good but had a slightly higher standard deviation than on previous passes. As on previous passes, the declination angle data showed a bias of +0.03 deg while hour angle data indicated a standard deviation of +0.03 deg. Residuals for this pass are presented in Fig. B-14 through B-17. The transmitter was turned off at 07:30:16, July 31. The end of the pass occurred with loss of signal at 09:14:37.

3. Station 41

a. Pass No. 1. Acquisition occurred at 17:35:24, July 28. The transmitter was turned on at 17:37:50 and two-way lock was confirmed at 17:38:48. However, good two-way doppler data were not taken until 17:54:02. This loss of 16 min of data was quite significant since data taken early in the mission are of much greater importance in the ODP than data taken later. The loss resulted from an overloaded counter monitoring the doppler mixer output. This situation arose as a direct result of a changed configuration in the L band receiver following L-S band conversion work and is not expected to occur again. At 21:51:05 the transmitter was turned off to allow Station 51 to transmit. Station 41 regained the transmitting assignment at 23:06:00 and kept it until 00:10:50, July 29. The two-way doppler data recorded during this pass were very good. An occasional problem did occur, however. The doppler counter apparently would drop either 100 or 200 cycles when it printed out an even hundred value. For instance at 21:21:02 a (raw) value of the doppler output of 1680104800 was recorded when the value (according to the determined orbit) should have been 1680104900. During this pass hour angle data showed a bias of −0.11 deg while declination angle data showed a bias of −0.07 deg. Residuals for this pass can be viewed in Fig. B-18 and B-19. Loss of signal at 01:17:00, July 29, marked the end of the pass.

b. Pass No. 2. Acquisition occurred at 14:13:55, July 29. The transmitter was turned on at 18:42:20 and stayed on until 01:45:22, July 30. Two-way doppler recorded during this pass were good with only a few data points lost. Hour angle data showed a bias of −0.07 deg while declination angle data showed a bias of −0.03 deg. Residuals can be seen in Fig. B-20 through B-23. The pass ended with loss of signal at 01:49:00.

c. Pass No. 3. Acquisition occurred at 14:36:03, July 30. The transmitter was turned on at 18:58:57 and turned off at 23:40:00. Good two-way doppler data were taken during the entire span of the transmitter on time. The signal level was unusually low due to a marginal parametric amplifier in the receiver system; however, this does not appear to have degraded the two-way doppler data in any way. During this pass hour angle data indicated a bias of −0.06 deg while declination angle data indicated a bias of −0.04 deg. The pass was terminated with loss of signal at 01:59:00, July 31. Residuals are seen in Fig. B-24 through B-27.

4. Station 12

a. Pass No. 1. Acquisition occurred at 06:44:10, July 29. The transmitter was turned on at 07:07:30. Good two-way doppler data were taken during this pass. From 08:36:02 to 11:30:02 the station used the VCO, and during the rest of the pass it used the atomic frequency standard (AFS). One can obtain a good estimate of the relative stability and ensuing reduction of noise by comparing the residuals during these two time periods (Fig. B-28 and B-29). The standard deviation of the two-way doppler was approximately +0.03 cps during the time the VCO was in use while it was approximately +0.01 cps during the period the AFS was in use. The midcourse maneuver was executed during this pass. Midcourse motor burn was initiated at approximately 10:27:09 and was cut off at about 10:27:58. Total doppler shift was on the order of −186 cps. During this phase Station 12 took 1 sec doppler samples, which are presented in Fig. 18. The transmitter was turned off at 18:42:41; the pass was terminated with loss of lock at 18:45:35, July 29. Residuals can be seen in Fig. B-29 and B-30.

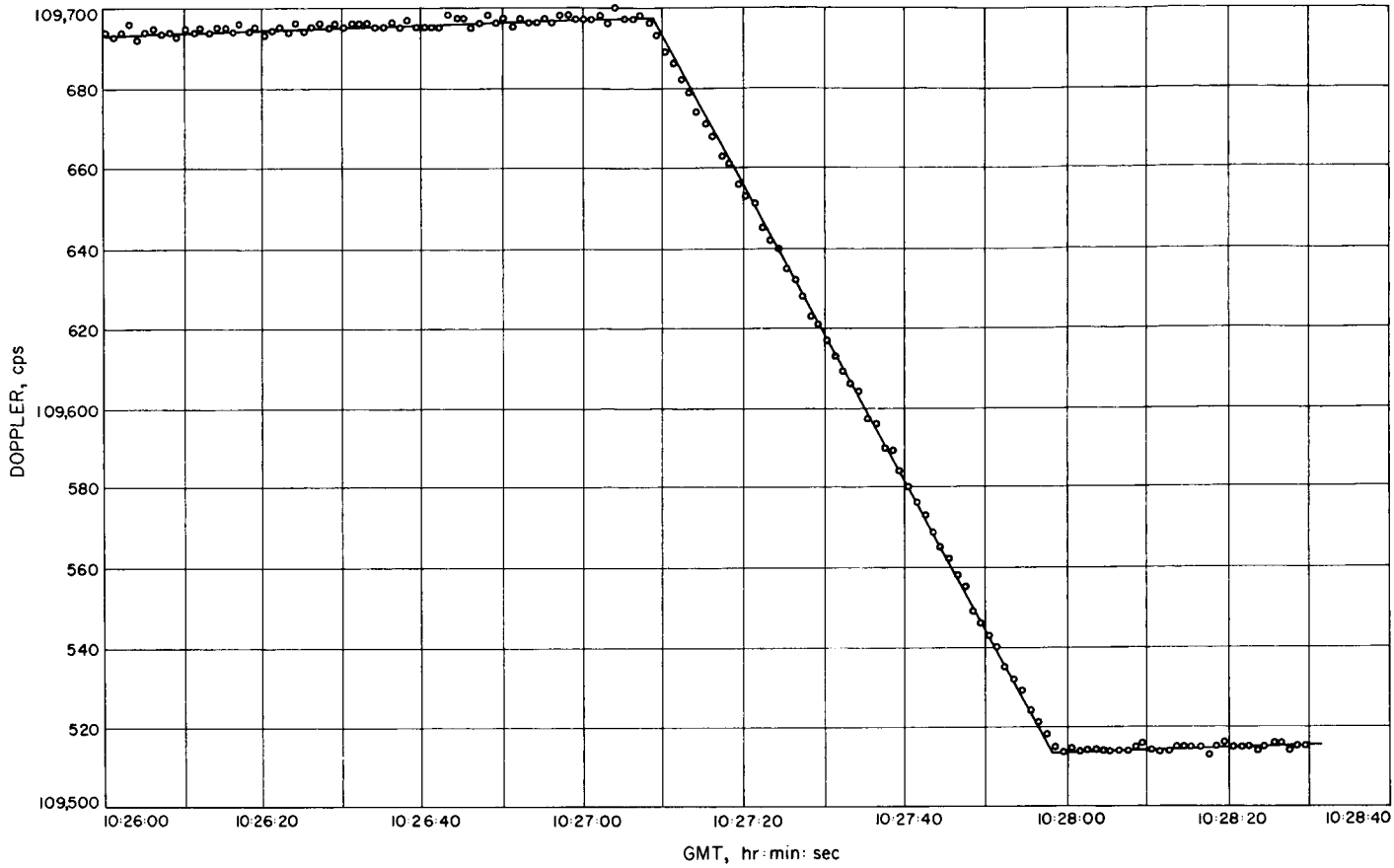

Fig. 18. Station 12 midcourse doppler change 1 sec samples (July 29, 1964)

b. Pass No. 2. Acquisition occurred at 06:55:30, July 30. The transmitter was turned on at 07:03:14. The AFS was used during the entire pass, and uniformly good two-way doppler data were taken. The doppler data showed a standard deviation of approximately 0.01 cps and a bias of +0.0001 cps. The transmitter was turned off at 18:59:13. The pass ended with loss of signal at 18:59:13, July 30. Residuals are seen in Fig. B-31 through B-33.

c. Pass No. 3. Acquisition occurred at 07:00:56, July 31. The transmitter was turned on at 07:30:00, July 31. The station used the AFS until 11:00:02 at which time it switched to the VCO, and one can view the large increase in residuals at that time (Fig. B-34). Previously very good two-way doppler were taken, with a standard deviation of approximately 0.01 cps. At 12:25:18, the doppler sample time was changed from 1 min to 10 sec and a very large increase in residuals can be seen at this time (Fig. B-35). As expected, the smaller sample time greatly increased the noise, the data during this time showing a standard deviation of 0.17 cps. The pass was concluded at 13:25:50.029, July 31, by the impact of *Ranger VII* on the Moon.

5. Summary

a. Station 59. Station 59 was able to get only five good two-way doppler samples during the launch pass, a rather unsatisfactory performance. Since Station 59 data are only important during the launch pass, it is imperative that the performance of the Station improve in future missions.

b. Station 51. Station 51 was unable to get any good two-way doppler samples and had receiver lock problems during the launch pass. During the next three passes it was able to get very good two-way doppler and encountered no further problems.

c. Station 41. Station 41 lost the first 16 min of two-way doppler data due to an overloaded counter. This loss of data is quite important because the data taken during

the early part of the mission are the most important in the ODP and are also the most important data in refining the values of certain physical constants. However, other than this, Station 41 took very good two-way doppler data during the rest of the mission, and the only problems encountered were minor, an occasional even hundred cycle dropout in the doppler data and a low signal strength during the last pass.

d. Station 12. Station 12 took very good two-way doppler data during the entire mission and encountered no problems.

e. DSIF stations in general. The overall quality of the tracking data was excellent, and the problems encountered were minor, especially when compared to the problems encountered in past missions.

APPENDIX A

Listings of the Station Transmitter VCO Frequencies

Table A-1. *Ranger VII* transmitter VCO frequencies

Station transmitting	Date, July 1964	Transmitter		VCO or synthesizer	
		on, GMT	off, GMT	GMT	Frequency, cps
59	28	17:20:50		17:20:37	29667274.0
				20:57	7253.4
				01:17	7253.5
				21:37	7253.4
				21:57	7253.5
				22:17	7253.6
				22:37	7253.6
				22:57	7253.8
				23:17	7253.7
				23:37	7511.5
				23:57	8354.9
				24:17	8387.4
				24:37	8387.3
				24:57	8387.2
				25:17	8387.1
				25:37	8699.4
				25:57	8991.3
				26:17	8984.7
				26:37	8985.4
				26:57	8985.2
				27:17	8985.2
				27:37	8985.2
				27:57	8985.2
				28:17	8985.1
				28:37	8985.1
				28:57	8985.0
				29:17	8985.0
				29:37	8985.0
				29:57	8984.9
				30:17	8984.9
				30:37	8984.8
				30:57	8984.8
			17:31:14	31:17	8984.8
51	28	17:32:12		17:32:12	29668786.0
				32:32	8754.0
				32:42	8754.0
				33:02	8754.0
				33:18	8754.5
				33:38	8754.5
				33:58	8754.6
				34:18	8754.7
				34:38	8754.7
				34:58	8754.7
				35:18	8754.7
				35:38	8754.7
				35:58	8754.8
				36:18	8754.8
				36:38	8754.9
51	28	17:32:12		17:36:58	29668754.9
				37:18	8754.9
				37:38	8755.7
				37:58	8755.5
				38:18	8755.1
				38:38	8755.0
				38:58	8755.1
			17:39:00	39:18	8755.1
41	28	17:38:00		17:37:59	29668169.0
				42:51	8169.1
				47:51	8169.1
				52:51	8169.1
				57:51	8169.1
				18:02:51	8169.1
				07:51	8169.1
				12:51	8169.0
				17:51	8169.0
				22:51	8169.0
				27:51	8169.0
				32:51	8169.0
				37:51	8169.0
				42:51	8169.0
				47:51	8168.9
				52:51	8169.0
				57:51	8169.0
				19:02:51	8169.0
				07:51	8169.0
				12:51	8169.0
				17:51	8169.0
				22:51	8169.0
				27:51	8169.0
				32:51	8168.9
				37:51	8169.0
				42:51	8168.0
				47:51	8168.0
				52:51	8168.0
				57:51	8169.0
				20:02:51	8169.0
				07:51	8168.0
				12:51	8169.0
				17:51	8169.0
				22:51	8169.0
				27:51	8168.9
				32:51	8168.9
				37:51	8168.9
				42:51	8169.0
				47:51	8169.0
				52:51	8168.0

Table A-1. *Ranger VII* transmitter VCO frequencies (Cont'd)

Station transmitting	Date, July 1964	Transmitter		VCO or synthesizer	
		on, GMT	off, GMT	GMT	Frequency, cps
41	28	17:38:00		20:57:51	29668169.0
				21:02:51	8169.0
				07:51	8500.0
				12:51	8510.0
				17:45	8510.2
				22:45	8510.4
				27:45	8510.4
				32:45	8510.4
				37:45	8510.5
				42:51	8470.7
				47:49	8470.8
			21:49:20	49:29	8470.7
51	28	21:51:03		21:51:05	29668414.3
				56:00	8424.0
				22:01:00	8424.0
				06:00	8424.0
				11:00	8424.1
				16:00	8424.1
				21:00	8424.2
				26:00	8424.1
				31:00	8424.2
				36:00	8424.3
				41:00	8424.3
				46:00	8424.4
				51:00	8424.4
				56:00	8424.4
				23:01:08	8423.8
				06:08	8423.8
			23:07:52	11:08	8423.9
41	28	23:06:00		23:06:01	29668448.0
				11:05	8448.4
				16:05	8448.6
				21:05	8448.6
				26:05	8448.7
				31:05	8448.8
				36:05	8448.8
				41:05	8448.9
				46:05	8448.9
				51:05	8449.0
				56:05	8449.0
	29			00:01:05	8449.0
				06:05	8449.0
			00:10:32	10:45	8449.2
51	29	00:10:02		00:10:02	29668391.0
				15:12	8391.6
				20:12	8391.6
				25:12	8391.6
				30:12	8391.5
				35:12	8391.5
				40:12	8391.5
				45:12	8391.5
				50:12	8391.6
				55:12	8391.5

Station transmitting	Date, July 1964	Transmitter		VCO or synthesizer	
		on, GMT	off, GMT	GMT	Frequency, cps
51	29	00:10:02		01:00:12	29668391.5
				05:12	8391.5
				10:12	8391.6
				15:12	8391.5
				20:12	8391.6
				25:12	8391.5
				30:12	8391.6
				35:12	8391.6
				40:12	8391.5
				45:12	8391.5
				50:12	8391.5
				55:12	8391.5
				02:00:12	8391.6
				05:12	8391.5
				10:12	8391.6
				15:12	8391.6
				20:12	8391.6
				25:12	8391.6
				30:12	8391.6
				35:12	8391.6
				40:12	8391.6
				45:12	8391.6
				50:12	8391.6
				55:12	8391.5
				03:00:12	8391.6
				05:12	8391.7
				10:12	8391.6
				15:12	8391.7
				20:12	8391.7
				25:12	8391.6
				30:12	8391.6
				35:12	8391.6
				40:12	8391.6
				45:12	8391.7
				50:12	8391.6
				55:12	8391.7
				04:00:12	8391.6
				05:12	8391.7
				10:12	8391.6
				15:12	8391.6
				20:12	8391.6
				25:12	8391.6
				30:12	8391.6
				35:12	8391.6
				40:12	8391.7
				45:12	8391.6
				50:12	8391.7
				55:12	8391.6
				05:00:12	8391.6
				05:12	8391.5
				10:12	8391.7
				15:12	8391.6
				20:12	8391.6
				25:12	8391.6

Table A-1. *Ranger VII* transmitter VCO frequencies (Cont'd)

Station transmitting	Date, July 1964	Transmitter		VCO or synthesizer	
		on, GMT	off, GMT	GMT	Frequency, cps
51	29	00:10:02		05:30:12	29668391.7
				35:12	8391.6
				40:12	8391.7
				45:12	8391.6
				50:12	8391.6
				55:12	8391.6
				06:00:12	8391.6
				05:12	8391.6
				10:12	8391.7
				15:12	8391.6
				20:12	8391.6
				25:12	8391.7
				30:12	8391.6
				35:12	8391.6
				40:12	8391.5
				45:12	8391.6
				50:12	8391.5
				55:12	8391.6
				07:00:12	8391.7
				05:12	8391.6
			07:08:00	08:12	8391.6
12	29	07:07:30		07:07:36	29668302.1
				12:40	8300.0
				17:50	8300.0
				22:40	8300.0
				27:50	8300.0
				32:50	8300.0
				37:40	8300.0
				42:40	8300.0
				47:40	8300.0
				52:40	8300.0
				57:50	8300.0
				08:02:40	8300.0
				07:40	8300.0
				12:40	8300.0
				17:40	8300.0
				22:40	8300.0
				27:40	8300.1
				32:50	8300.1
				37:50	8300.3
				42:50	8300.3
				47:50	8300.3
				52:50	8300.4
				57:59	8300.3
				09:02:40	8300.4
				07:40	8300.4
				12:40	8300.4
				17:40	8300.4
				22:40	8300.4
				27:49	8300.4
				32:59	8300.4
				37:40	8300.4
				42:40	8300.4
				47:40	8300.4
12	29	07:07:30		09:52:50	29668300.4
				57:40	8300.5
				10:02:40	8300.4
				07:40	8300.4
				12:40	8300.4
				17:40	8300.5
				22:50	8300.5
				27:50	8300.4
				32:50	8300.4
				37:50	8300.4
				42:40	8300.5
				47:40	8300.5
				51:40	8300.5
				57:40	8300.5
				11:02:40	8300.5
				07:40	8300.5
				12:40	8300.5
				17:40	8300.5
				22:40	8300.5
				27:40	8300.5
				32:40	8300.0
				37:40	8300.0
				42:40	8300.0
				47:40	8300.0
				52:50	8300.0
				57:40	8300.1
				12:02:40	8300.0
				07:50	8300.0
				12:50	8300.1
				17:50	8300.0
				22:50	8300.0
				27:50	8300.0
				32:50	8300.0
				37:50	8300.0
				42:50	8300.0
				47:50	8300.1
				52:50	8300.1
				57:50	8300.1
				13:02:50	8300.1
				07:50	8300.1
				12:40	8300.0
				17:40	8300.1
				22:39	8300.0
				27:49	8300.1
				32:50	8300.1
				37:50	8300.0
				42:50	8300.0
				47:50	8300.0
				52:50	8300.0
				57:40	8300.0
				14:02:40	8300.0
				07:49	8300.0
				12:30	8300.0
				17:40	8300.0

Table A-1. *Ranger VII* transmitter VCO frequencies (Cont'd)

Station transmitting	Date, July 1964	Transmitter		VCO or synthesizer	
		on, GMT	off, GMT	GMT	Frequency, cps
12	29	07:07:30		14:22:50	29668300.0
				27:50	8300.0
				32:50	8300.0
				37:40	8300.0
				42:50	8300.0
				47:50	8300.0
				52:50	8300.0
				57:50	8300.0
				15:02:50	8300.0
				07:50	8300.0
				12:40	8300.0
				17:50	8300.0
				22:50	8300.0
				27:50	8300.0
				32:50	8300.0
				37:50	8300.1
				42:40	8300.1
				47:50	8300.0
				52:40	8300.1
				16:02:40	8300.0
				07:50	8300.0
				12:50	8300.0
				17:50	8300.0
				22:50	8300.0
				27:50	8300.0
				32:50	8300.0
				37:50	8300.0
				42:50	8300.0
				47:40	8300.0
				52:40	8300.0
				57:40	8300.1
				17:02:40	8300.0
				07:40	8300.0
				12:50	8300.0
				17:59	8300.0
				22:40	8300.0
				27:50	8300.0
				32:40	8300.0
				37:50	8300.0
				42:50	8300.0
				47:50	8300.0
				52:40	8300.0
				57:50	8300.0
				18:02:50	8300.0
				07:50	8300.0
				12:50	8300.0
				17:40	8300.0
				22:50	8300.0
				27:50	8300.0
				32:30	8300.0
				37:40	8300.0
			18:42:41	42:40	8300.1
41	29	18:42:22		18:42:22	29668249.0
				47:19	8249.3

Station transmitting	Date, July 1964	Transmitter		VCO or synthesizer	
		on, GMT	off, GMT	GMT	Frequency, cps
41	29	18:42:22		18:52:19	29668249.3
				57:19	8249.3
				19:02:19	8249.2
				07:19	8249.2
				12:19	8249.3
				17:19	8249.3
				22:19	8249.4
				27:19	8249.3
				32:19	8249.3
				37:19	8249.3
				42:19	8249.3
				47:19	8249.4
				52:19	8249.3
				57:19	8249.3
				20:02:19	8249.4
				07:19	8249.4
				12:19	8249.4
				17:19	8249.4
				22:19	8249.4
				27:19	8249.4
				32:19	8249.4
				37:19	8249.4
				42:19	8249.3
				47:19	8249.4
				52:19	8249.4
				57:19	8249.4
				21:02:19	8249.5
				07:19	8249.4
				12:19	8249.5
				17:19	8249.4
				22:19	8249.4
				27:19	8249.5
				32:19	8249.4
				37:19	8249.5
				42:19	8249.5
				47:19	8249.4
				52:19	8249.5
				57:19	8249.5
				22:02:19	8249.5
				07:19	8249.5
				12:19	8249.5
				17:19	8249.5
				22:19	8249.5
				27:19	8249.5
				32:19	8249.5
				37:19	8249.4
				42:19	8249.4
				47:19	8249.5
				52:19	8249.5
				57:19	8249.5
				23:02:19	8249.5
				07:19	8249.5
				12:19	8249.5
				17:19	8249.5

Table A-1. *Ranger VII* transmitter VCO frequencies (Cont'd)

Station transmitting	Date, July 1964	Transmitter		VCO or synthesizer	
		on, GMT	off, GMT	GMT	Frequency, cps
41	29	18:42:22		23:22:19	29668249.5
				27:19	8249.5
				32:19	8249.6
				37:19	8249.5
				42:19	8249.5
				47:19	8249.5
				52:19	8249.7
				57:19	8249.6
	30			00:02:19	8249.6
				07:19	8249.7
				12:19	8249.6
				17:19	8249.6
				22:19	8249.7
				27:19	8249.6
				32:19	8249.7
				37:19	8249.7
				42:19	8249.6
				47:19	8249.6
				52:19	8249.6
				57:19	8249.5
				01:02:19	8249.6
				07:19	8249.6
				12:19	8249.6
				17:19	8249.6
				22:19	8249.6
				27:19	8249.6
				32:28	8279.4
				37:28	8279.4
				42:28	8279.5
			01:45:22	45:28	8279.4
51	30	01:45:13		01:45:01	29668224.0
				50:04	8224.7
				55:04	8224.7
				02:00:04	8224.7
				05:04	8224.7
				10:04	8224.6
				15:05	8224.7
				20:05	8224.7
				25:05	8224.6
				30:05	8224.6
				35:05	8224.6
				40:05	8224.6
				45:05	8224.5
				50:05	8224.5
				55:05	8224.6
				03:00:05	8224.5
				05:05	8224.5
				10:05	8224.5
				15:05	8224.5
				20:06	8224.5
				25:06	8224.5
				30:06	8224.4
				35:06	8224.4
				40:06	8224.3
				45:06	8224.4
51	30	01:45:13		03:50:06	29668224.3
				55:07	8224.3
				04:00:07	8224.3
				05:07	8224.3
				10:07	8224.3
				15:07	8224.2
				20:07	8224.3
				25:07	8224.2
				30:07	8224.2
				35:07	8224.2
				40:07	8224.2
				45:07	8224.1
				50:07	8224.2
				55:07	8224.1
				05:00:07	8224.0
				05:07	8224.0
				10:07	8224.0
				15:08	8223.9
				20:08	8223.9
				25:08	8223.9
				30:08	8223.9
				35:08	8223.9
				40:08	8223.8
				45:08	8223.8
				50:09	8223.9
				55:10	8223.8
				06:00:11	8223.8
				05:12	8223.8
				10:13	8223.7
				15:13	8223.7
				20:13	8223.7
				25:13	8223.7
				30:13	8223.6
				35:13	8223.6
				40:13	8223.5
				45:13	8223.6
				50:00	8232.0
				55:00	8232.1
				07:00:00	8232.1
				05:00	8232.1
				10:00	8232.1
				15:00	8232.1
12	30	07:03:14		07:03:00	29668162.2
				08:00	8202.0
				13:10	8162.0
				18:10	8200.0
				23:10	8200.0
				28:00	8200.0
				33:00	8200.0
				38:00	8200.0
				43:00	8200.0
				48:00	8200.0
				53:00	8200.0
				58:00	8200.1
				08:03:00	8200.0

Table A-1. *Ranger VII* transmitter VCO frequencies (Cont'd)

Station transmitting	Date, July 1964	Transmitter		VCO or synthesizer	
		on, GMT	off, GMT	GMT	Frequency, cps
12	30	07:03:14		08:08:00	29668200.0
				13:10	8200.0
				18:00	8200.1
				23:10	8200.0
				28:00	8200.1
				33:00	8200.1
				38:10	8200.1
				43:10	8200.0
				48:10	8200.0
				53:10	8200.0
				58:10	8200.0
				09:03:10	8200.0
				08:00	8200.1
				13:10	8200.0
				18:10	8200.0
				23:10	8200.0
				28:10	8200.1
				33:10	8200.0
				38:10	8200.1
				43:10	8200.0
				48:10	8200.0
				53:10	8200.0
				58:10	8200.0
				10:03:10	8200.0
				08:10	8200.0
				13:10	8200.0
				18:10	8200.0
				23:10	8200.0
				28:10	8200.0
				33:10	8200.0
				38:10	8200.1
				43:10	8200.0
				48:10	8200.0
				53:00	8200.1
				58:00	8200.1
				11:03:00	8200.0
				08:00	8200.0
				13:00	8200.1
				18:10	8200.1
				23:10	8200.1
				28:10	8200.1
				33:10	8200.1
				38:10	8200.0
				43:10	8200.1
				48:10	8200.1
				53:10	8200.1
				58:10	8200.0
				12:02:10	8200.0
				07:10	8200.0
				12:10	8200.0
				17:10	8200.1
				22:10	8200.0
				27:10	8200.0
				32:10	8200.1
				37:10	8200.1
12	30	07:03:14		12:42:10	29668200.0
				47:00	8200.0
				52:10	8200.0
				57:00	8200.0
				13:02:00	8200.0
				07:00	8200.0
				12:00	8200.0
				17:10	8200.0
				22:00	8200.0
				27:00	8200.0
				32:00	8200.1
				37:10	8200.0
				42:10	8200.0
				47:00	8200.0
				52:10	8200.0
				57:10	8200.0
				14:02:00	8200.0
				07:10	8200.0
				12:00	8200.0
				17:00	8200.0
				22:00	8200.0
				27:00	8200.0
				32:00	8200.0
				37:00	8200.0
				42:00	8200.0
				47:00	8200.0
				52:00	8200.0
				57:00	8200.0
				15:03:00	8200.0
				08:00	8200.0
				13:00	8200.0
				18:00	8200.0
				23:00	8200.0
				28:00	8200.0
				33:10	8200.0
				38:10	8200.0
				43:00	8200.0
				48:10	8200.0
				53:10	8200.0
				58:10	8200.0
				16:02:00	8200.0
				07:00	8200.0
				12:10	8200.0
				17:10	8200.0
				22:10	8200.0
				27:10	8200.0
				32:10	8200.0
				37:00	8200.0
				42:00	8200.0
				47:00	8200.0
				52:00	8200.0
				57:00	8200.0
				17:02:10	8200.0
				07:10	8200.0
				12:10	8200.0

Table A-1. *Ranger VII* transmitter VCO frequencies (Cont'd)

Station transmitting	Date, July 1964	Transmitter		VCO or synthesizer	
		on, GMT	off, GMT	GMT	Frequency, cps
12	30	07:03:14		17:17:00	29668200.0
				22:00	8200.0
				27:00	8200.0
				32:00	8200.0
				37:00	8200.0
				42:00	8200.0
				46:20	8200.0
				48:00	8200.0
				53:00	8200.0
				58:00	8200.0
				18:03:00	8200.0
				07:10	8200.0
				12:10	8200.0
				17:10	8200.0
				22:10	8200.0
				27:10	8200.0
				32:10	8200.0
				37:10	8200.0
				42:10	8200.0
				47:10	8200.0
				52:10	8200.0
				57:10	8200.0
			18:59:13	59:10	8200.0
41	30	18:58:57		18:58:55	29668149.0
				19:03:44	8149.6
				08:44	8149.6
				13:44	8149.6
				18:44	8149.5
				23:44	8149.5
				28:44	8149.5
				33:44	8149.5
				38:44	8149.5
				43:44	8149.5
				48:44	8149.4
				53:44	8149.5
				58:44	8149.5
				20:03:44	8149.5
				08:44	8149.5
				13:44	8149.5
				18:44	8149.5
				23:44	8149.5
				28:44	8149.5
				33:44	8149.5
				38:44	8149.6
				43:44	8149.6
				48:44	8149.5
				53:44	8149.4
				58:44	8149.5
				21:03:44	8149.5
				08:44	8149.5
				13:44	8149.5
				18:44	8149.5
				23:44	8149.5
				28:44	8149.5
41	30	18:58:57		21:33:44	29668149.5
				38:44	8149.5
				43:44	8149.5
				48:44	8149.5
				53:44	8149.5
				58:44	8149.5
				22:03:44	8149.5
				08:44	8149.5
				13:44	8149.5
				18:44	8149.5
				23:44	8149.4
				28:44	8149.5
				33:44	8149.5
				38:44	8149.6
				43:44	8149.5
				48:44	8149.5
				53:44	8149.5
				58:44	8149.5
				23:03:44	8149.5
				08:44	8149.5
				13:44	8149.6
				18:44	8149.5
				23:44	8149.5
				28:50	8232.3
				33:50	8232.4
				38:50	8232.4
			23:40:05	40:10	8232.4
51	30	23:40:00		23:40:03	29668168.4
				45:03	8168.4
				50:03	8168.3
				55:03	8168.3
	31			00:00:03	8168.4
				05:03	8168.3
				10:03	8168.3
				15:03	8168.3
				20:03	8168.3
				25:03	8168.2
				30:03	8168.2
				35:03	8168.2
				40:03	8168.2
				45:03	8168.2
				50:03	8168.2
				55:03	8168.1
				01:00:03	8168.1
				05:03	8168.2
				10:03	8168.1
				15:03	8168.1
				20:03	8168.1
				25:03	8168.1
				30:03	8168.0
				35:03	8168.1
				40:03	8168.1
				45:03	8168.0
				50:03	8168.0

Table A-1. *Ranger VII* transmitter VCO frequencies (Cont'd)

Station transmitting	Date, July 1964	Transmitter		VCO or synthesizer	
		on, GMT	off, GMT	GMT	Frequency, cps
51	31	23:40:00		01:55:03	29668168.0
				02:00:03	8168.0
				05:03	8168.1
				10:03	8168.7
				15:03	8167.9
				20:03	8167.9
				25:03	8167.8
				30:03	8167.8
				35:03	8167.8
				40:03	8167.8
				45:03	8167.8
				50:03	8167.7
				55:03	8167.7
				03:00:03	8167.7
				05:03	8167.7
				10:03	8167.6
				15:03	8167.6
				20:03	8167.6
				25:03	8167.6
				30:03	8167.6
				35:03	8167.6
				40:03	8167.5
				45:03	8167.5
				50:03	8167.5
				55:03	8167.5
				04:00:03	8167.5
				05:03	8167.5
				10:03	8167.4
				15:03	8167.3
				20:03	8167.3
				25:04	8167.3
				30:04	8167.3
				35:05	8167.2
				40:05	8167.2
				45:05	8167.2
				50:01	8167.1
				55:06	8167.1
				05:00:06	8167.1
				05:06	8167.1
				10:06	8167.2
				15:06	8167.1
				20:06	8167.1
				25:06	8167.0
			05:30:00	30:06	8166.9
		05:40:00		40:13	8200.4
51	31	05:40:00		05:45:13	29668200.4
				50:13	8200.4
				55:13	8200.5
				06:00:13	8200.5
				05:13	8200.5
				10:13	8200.5
				15:13	8200.5
				20:13	8200.5
				25:13	8200.5
				30:13	8200.4
51	31	05:40:00		06:35:13	29668200.5
				40:13	8200.4
				45:13	8200.3
				50:13	8200.3
				55:13	8200.3
				07:00:10	8200.2
				05:10	8200.2
				10:10	8200.2
				15:10	8200.2
				20:01	8221.0
				25:01	8222.0
			07:30:16	30:02	8221.9
12	31	07:30:00		07:30:00	29668150.0
				35:10	8200.0
				40:10	8200.0
				45:10	8200.0
				50:10	8200.0
				55:10	8200.0
				08:00:10	8200.0
				05:10	8200.0
				10:10	8200.0
				15:10	8200.0
				20:10	8200.0
				25:10	8200.0
				30:10	8200.0
				35:10	8200.0
				40:10	8200.0
				45:10	8200.0
				50:10	8200.0
				55:10	8200.0
				09:00:10	8200.0
				05:10	8200.0
				10:10	8200.0
				15:10	8200.0
				20:10	8200.0
				25:10	8200.0
				30:10	8200.0
				35:10	8200.0
				40:10	8200.1
				45:10	8200.0
				50:10	8200.0
				55:10	8200.0
				10:00:10	8200.0
				05:10	8200.0
				10:10	8200.0
				15:10	8200.0
				20:10	8200.0
				25:10	8200.0
				30:10	8200.0
				35:10	8200.0
				40:10	8200.1
				45:10	8200.0
				50:10	8200.0
				55:10	8200.0

Table A-1. *Ranger VII* transmitter VCO frequencies (Cont'd)

Station transmitting	Date, July 1964	Transmitter		VCO or synthesizer	
		on, GMT	off, GMT	GMT	Frequency, cps
12	31	07:30:00		11:00:10	29668199.7
				05:10	8199.0
				10:10	8198.9
				15:10	8198.8
				20:10	8198.7
				25:10	8198.7
				30:10	8198.7
				35:10	8198.6
				40:10	8198.6
				45:10	8198.5
				50:10	8198.5
				55:10	8198.4
				12:00:00	8198.4
				05:00	8198.3
				10:00	8198.3
				15:00	8198.3
12	31	07:30:00		12:20:00	29668198.3
				25:00	8199.3
				30:00	8198.3
				35:00	8198.4
				40:00	8198.3
				45:00	8198.4
				50:00	8198.4
				55:10	8198.5
				13:00:10	8198.5
				04:50	8198.6
				10:10	8198.7
				15:10	8198.7
				20:10	8198.8
				25:10	8198.8
				25:50	8198.9

APPENDIX B

Residual Plots from the ODP

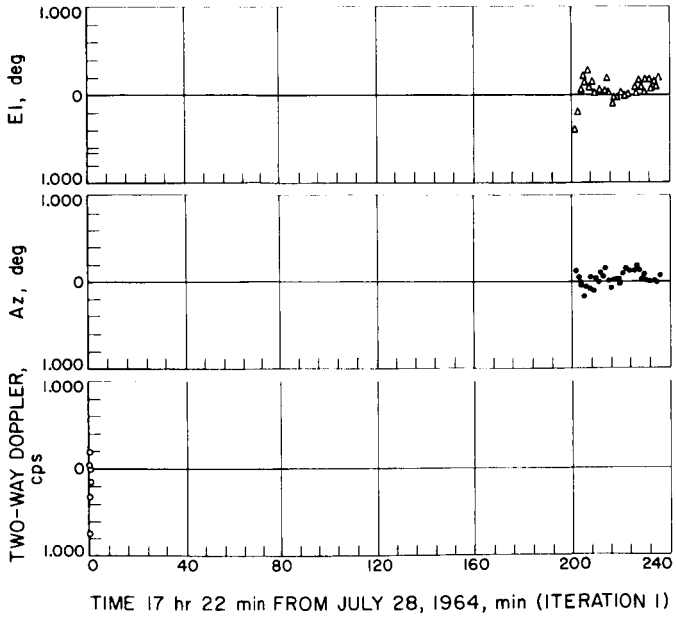

Fig. B-1. Station 59 residuals (start 17:22 GMT)

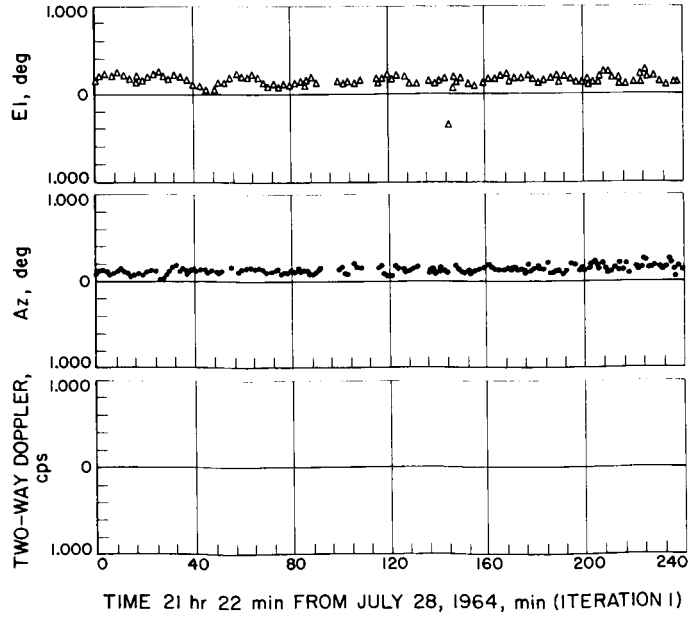

Fig. B-2. Station 59 residuals (start 21:22 GMT)

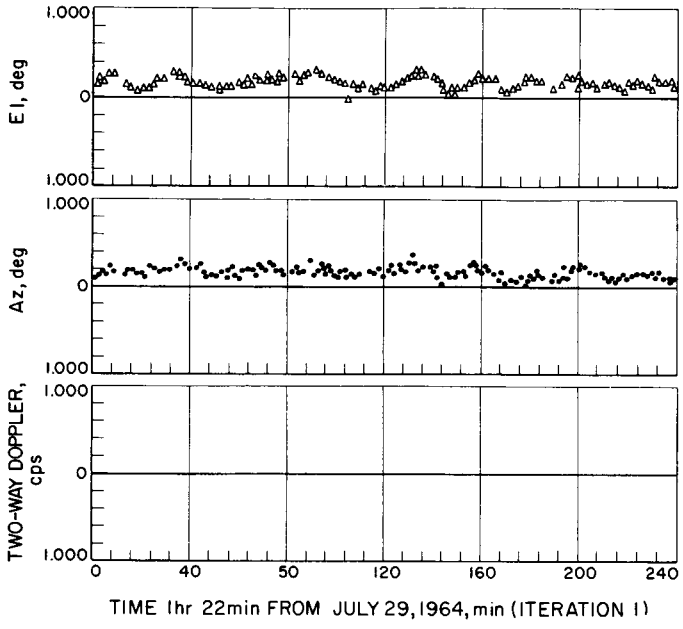

Fig. B-3. Station 59 residuals (start 01:22 GMT)

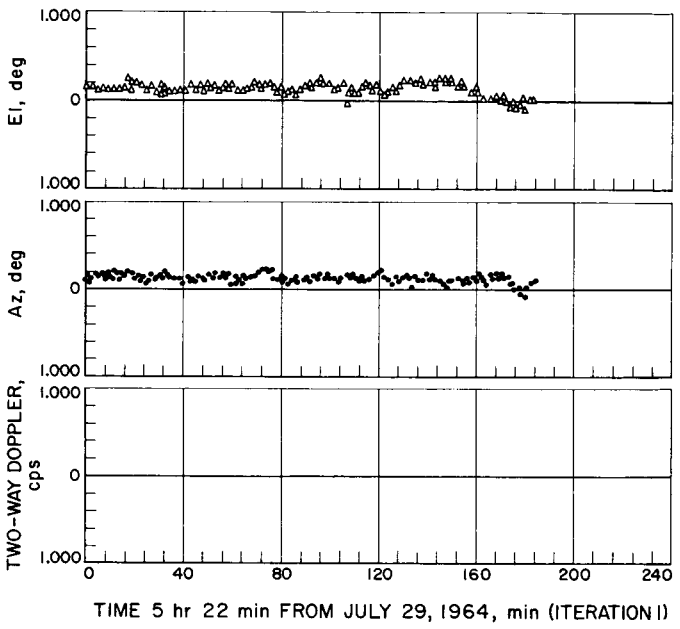

Fig. B-4. Station 59 residuals (start 05:22 GMT)

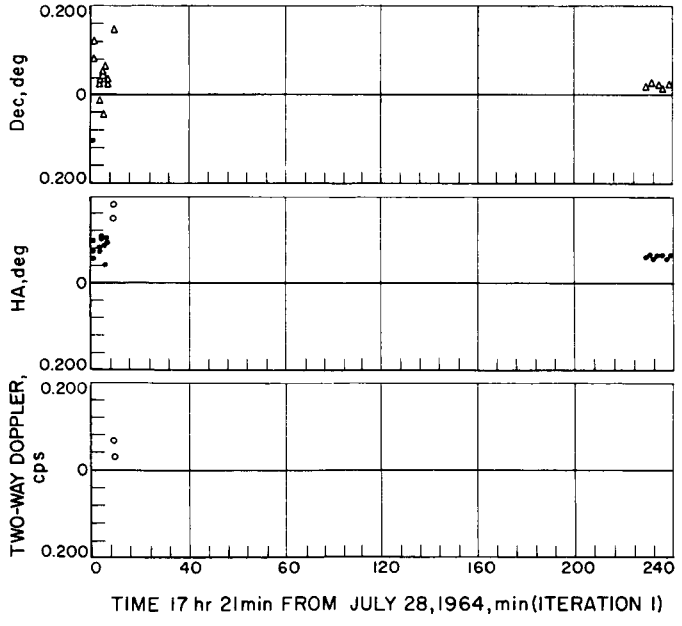

Fig. B-5. Station 51 residuals (start 17:21 GMT)

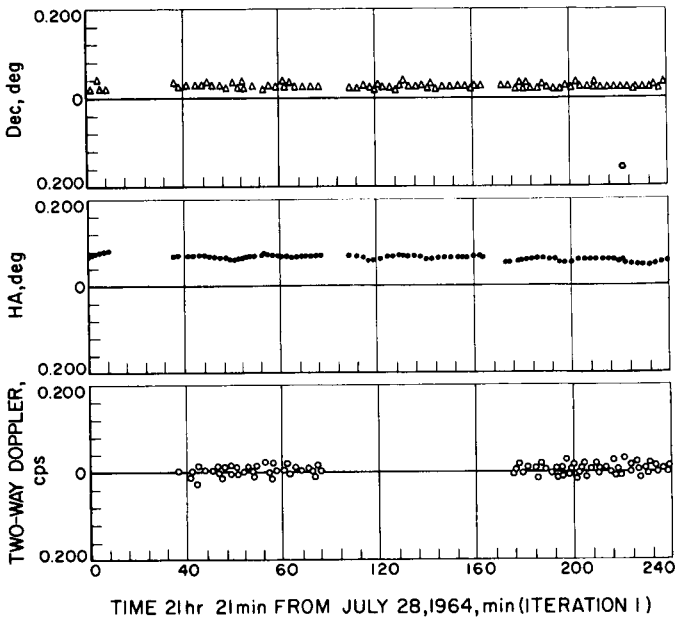

Fig. B-6. Station 51 residuals (start 21:21 GMT)

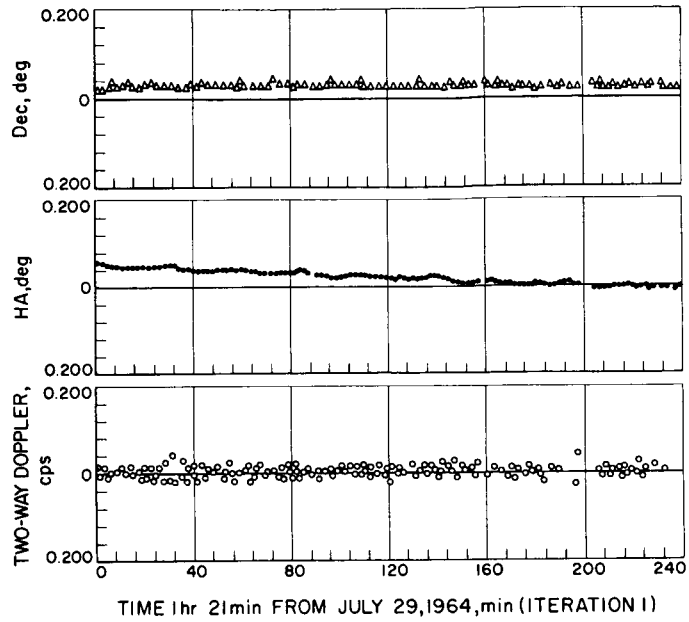

Fig. B-7. Station 51 residuals (start 01:21 GMT)

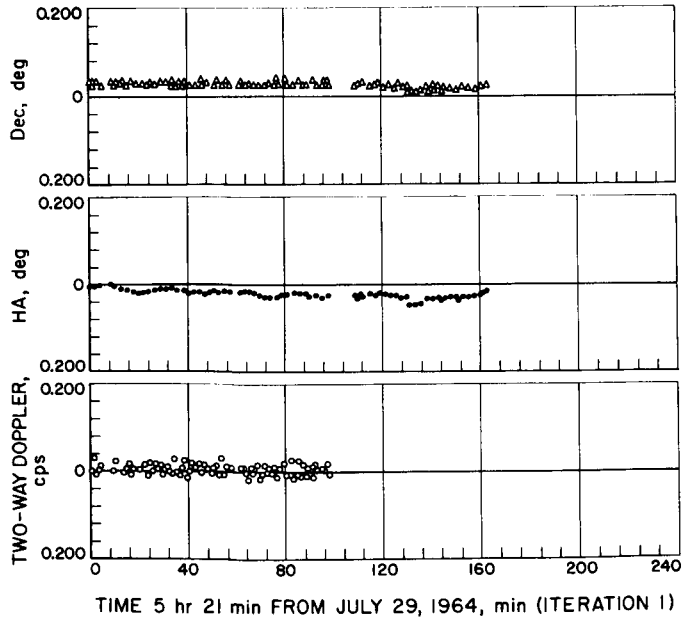

Fig. B-8. Station 51 residuals (start 05:21 GMT)

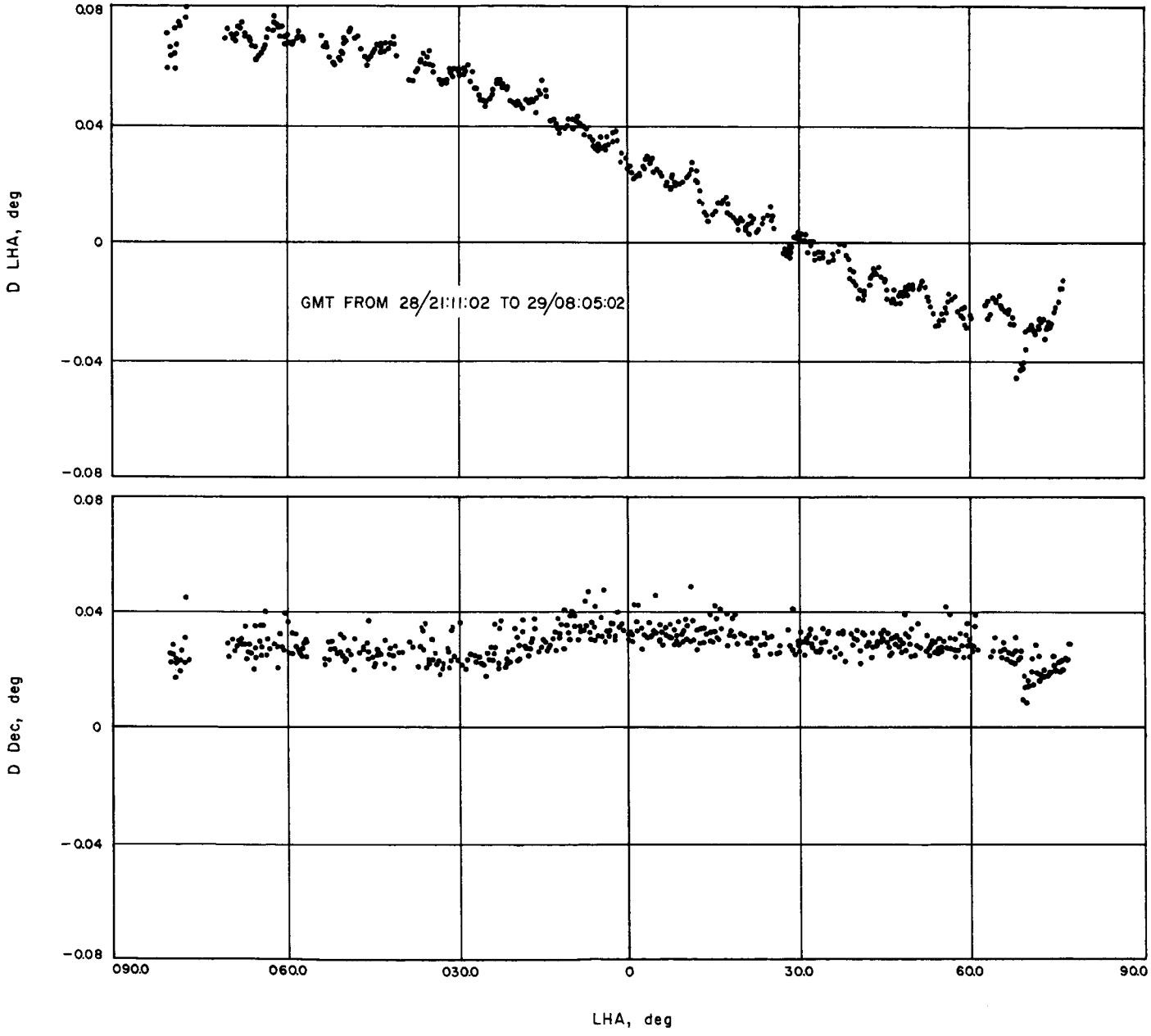

Fig. B-9. Station 51 residuals (start 21:11 GMT)

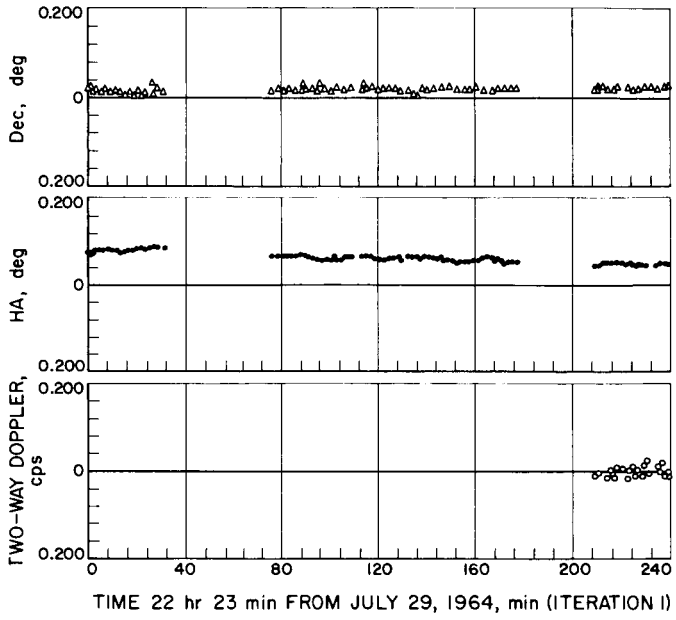

Fig. B-10. Station 51 residuals (start 22:23 GMT)

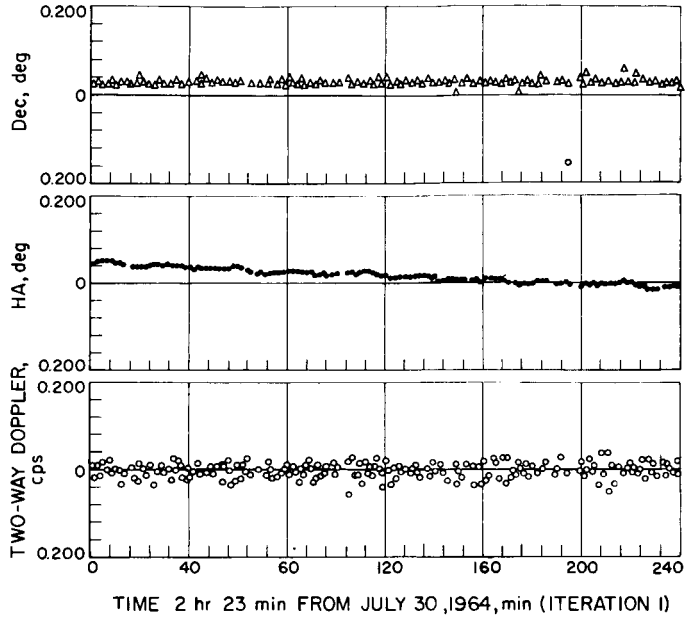

Fig. B-11. Station 51 residuals (start 02:23 GMT)

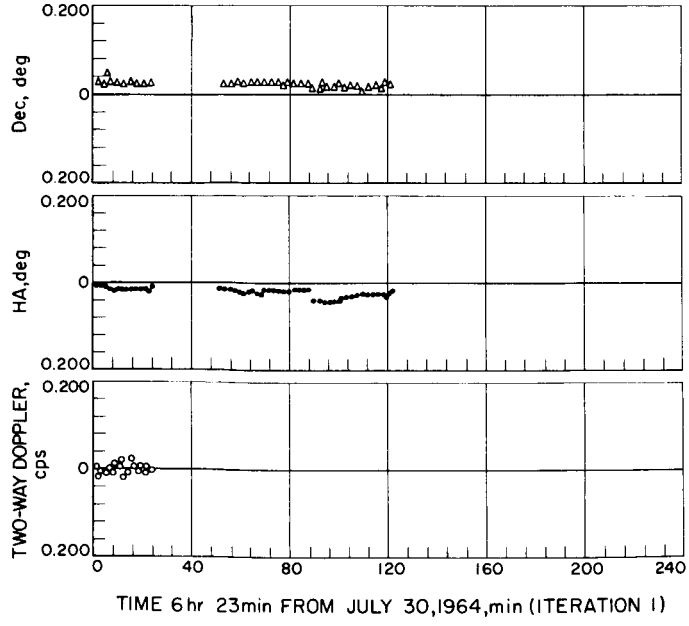

Fig. B-12. Station 51 residuals (start 06:23 GMT)

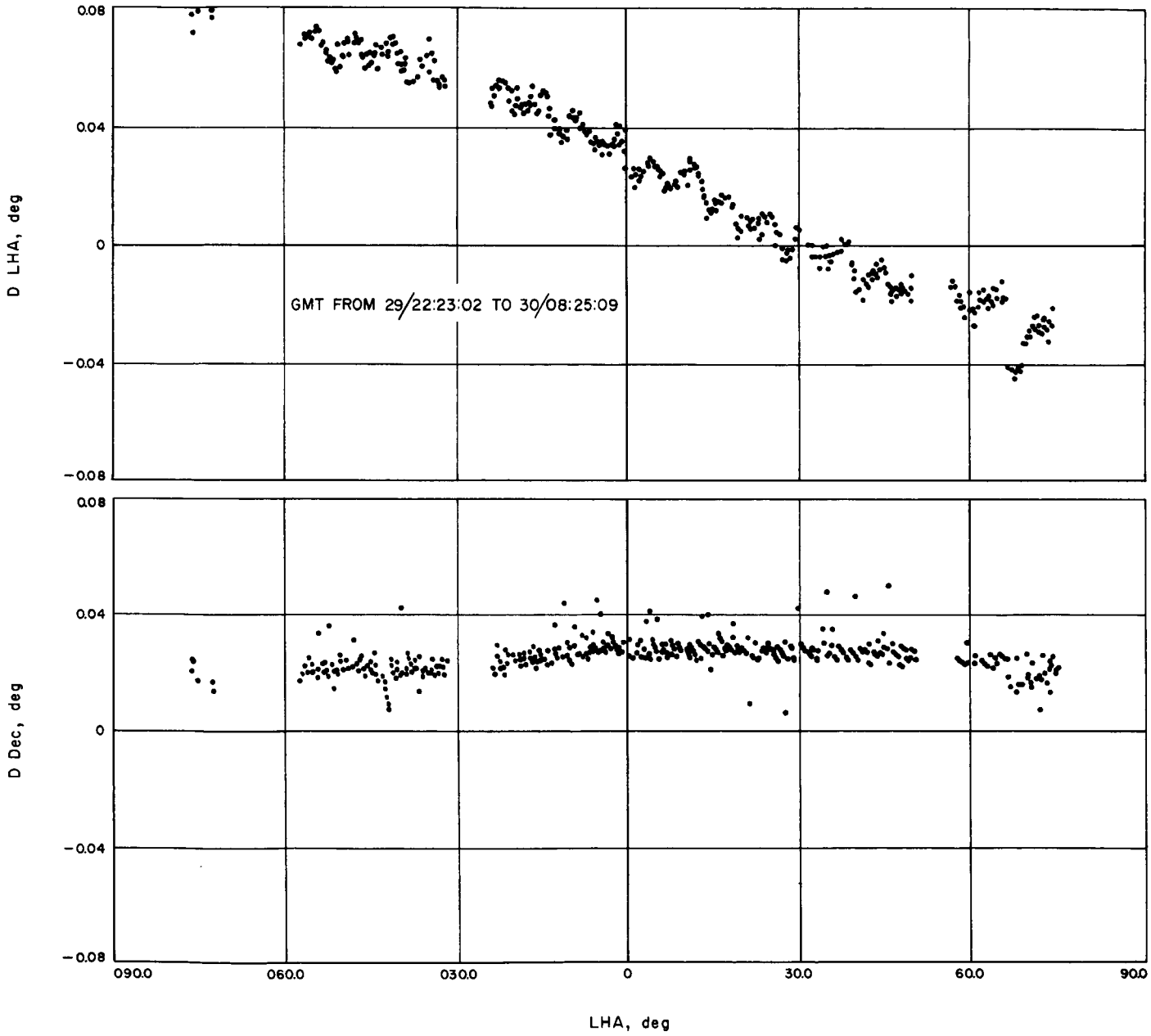

Fig. B-13. Station 51 residuals (start 22:23 GMT)

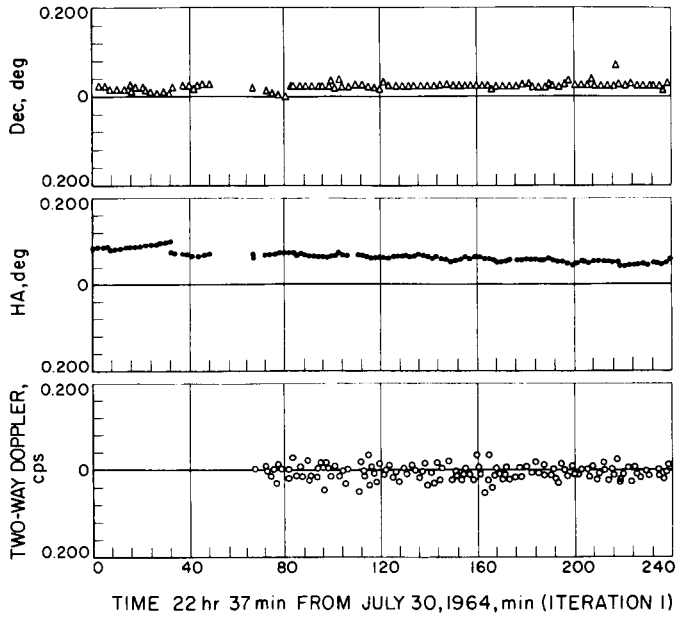

Fig. B-14. Station 51 residuals (start 22:37 GMT)

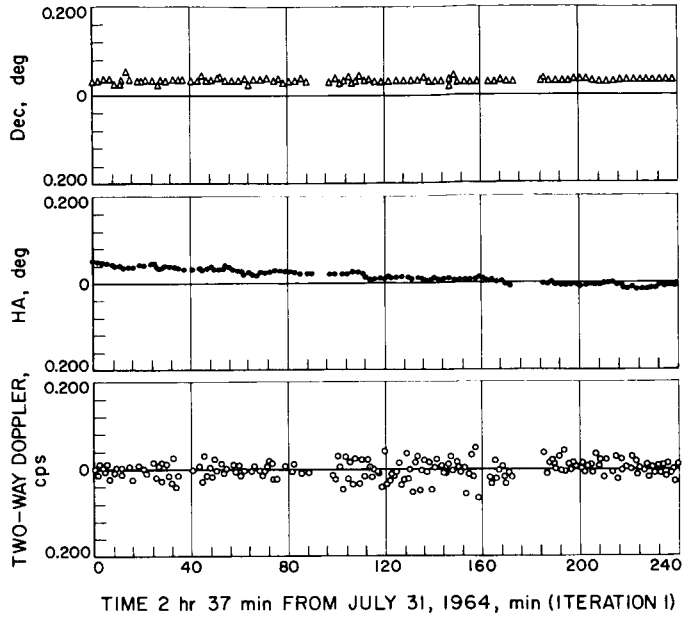

Fig. B-15. Station 51 residuals (start 02:37 GMT)

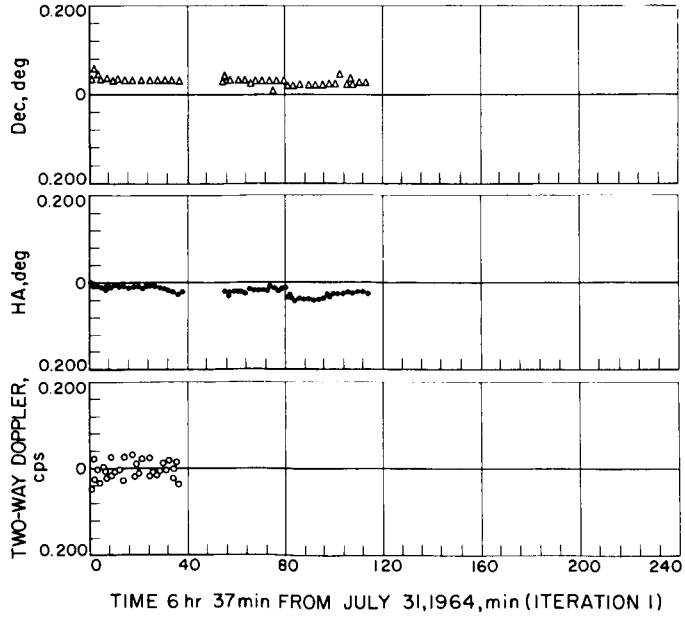

Fig. B-16. Station 51 residuals (start 06:37 GMT)

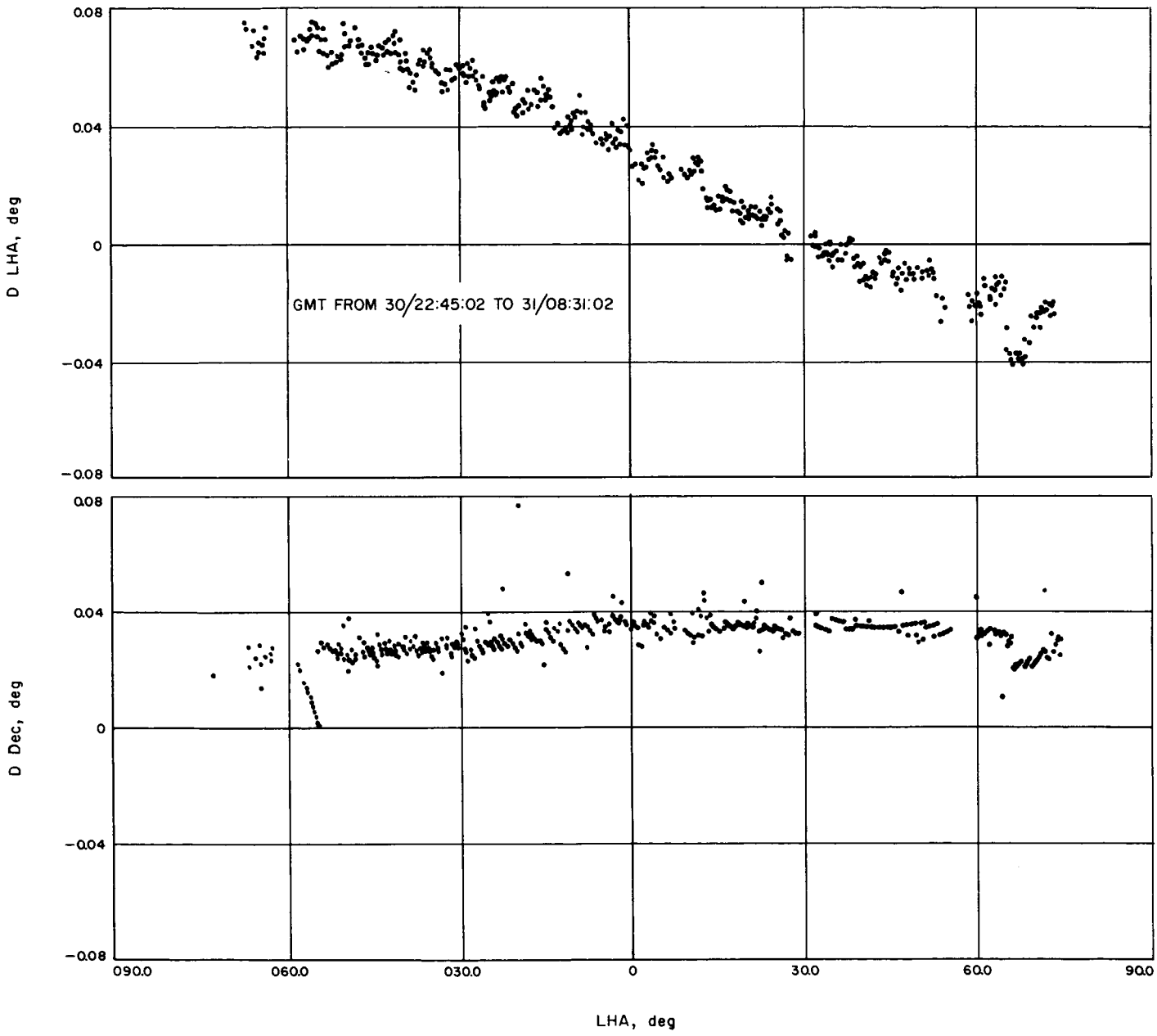

Fig. B-17. Station 51 residuals (start 22:45 GMT)

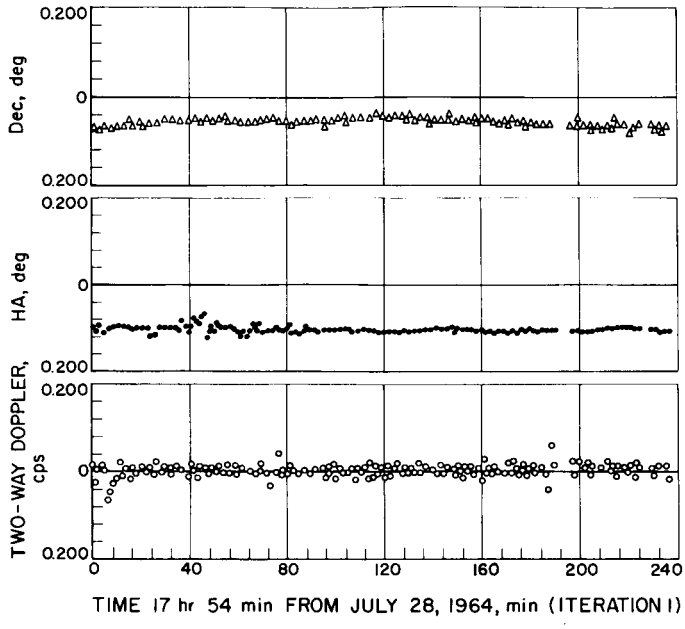

Fig. B-18. Station 41 residuals (start 17:54 GMT)

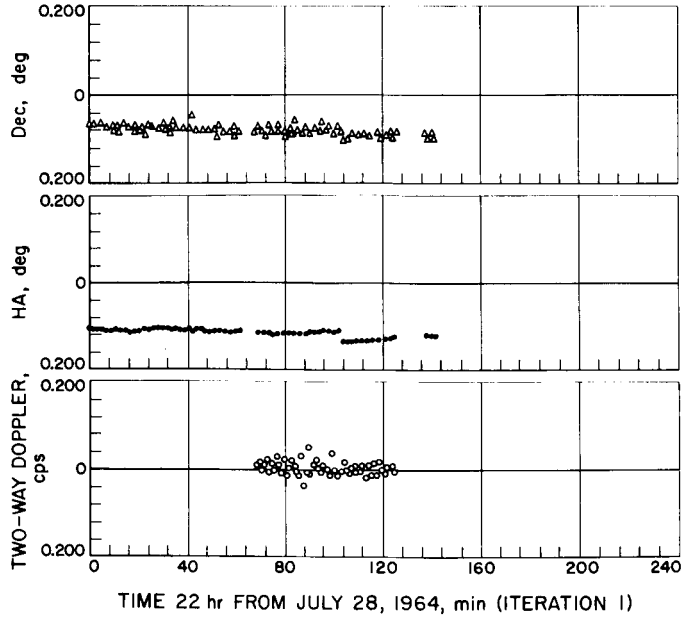

Fig. B-19. Station 41 residuals (start 22:00 GMT)

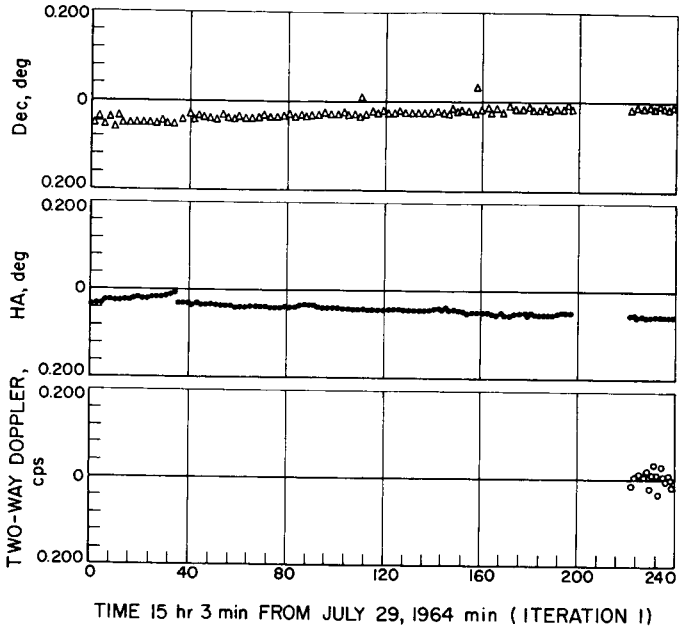

Fig. B-20. Station 41 residuals (start 15:03 GMT)

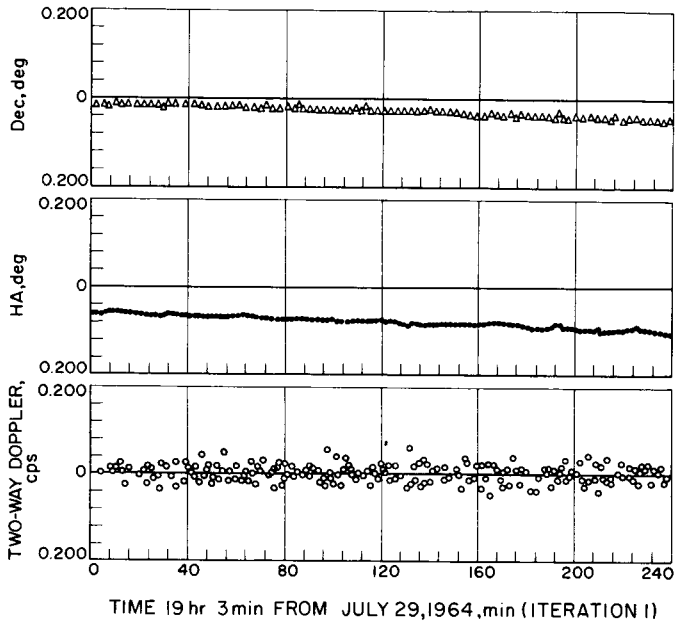

Fig. B-21. Station 41 residuals (start 19:03 GMT)

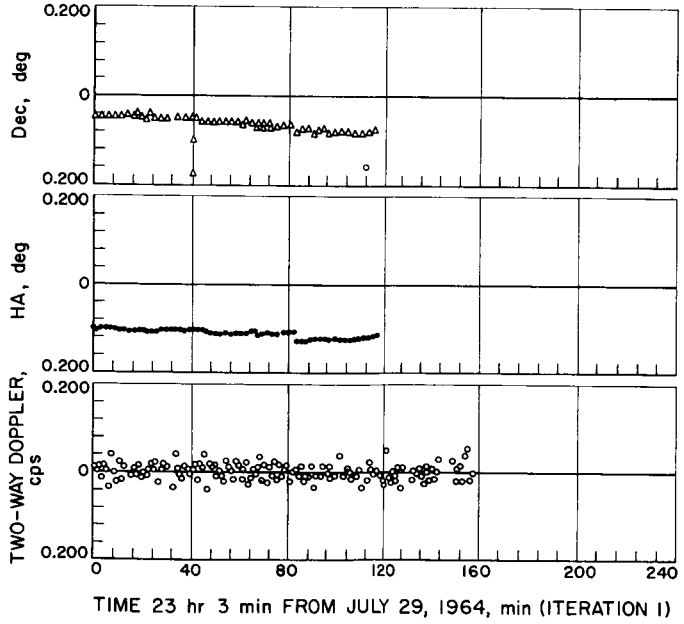

Fig. B-22. Station 41 residuals (start 23:03 GMT)

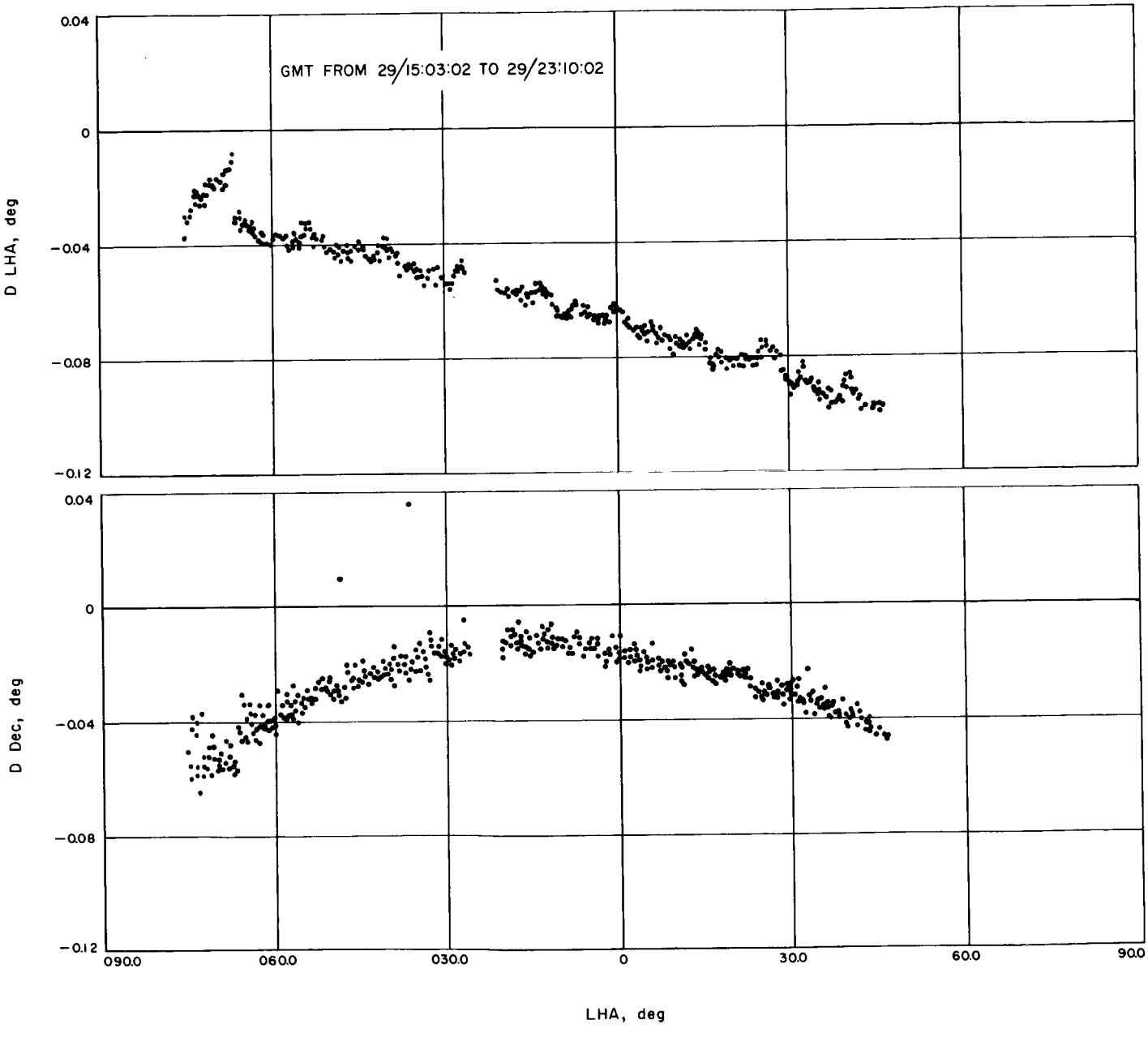

Fig. B-23. Station 41 residuals (start 15:03 GMT)

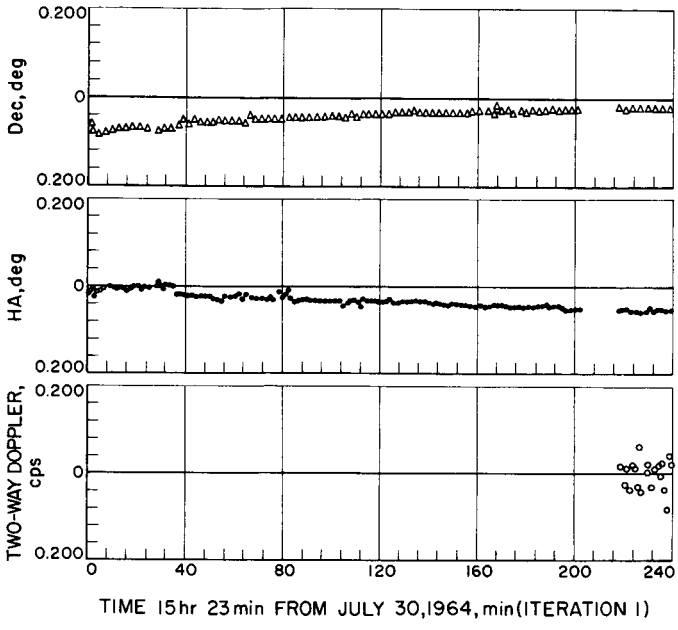

Fig. B-24. Station 41 residuals (start 15:23 GMT)

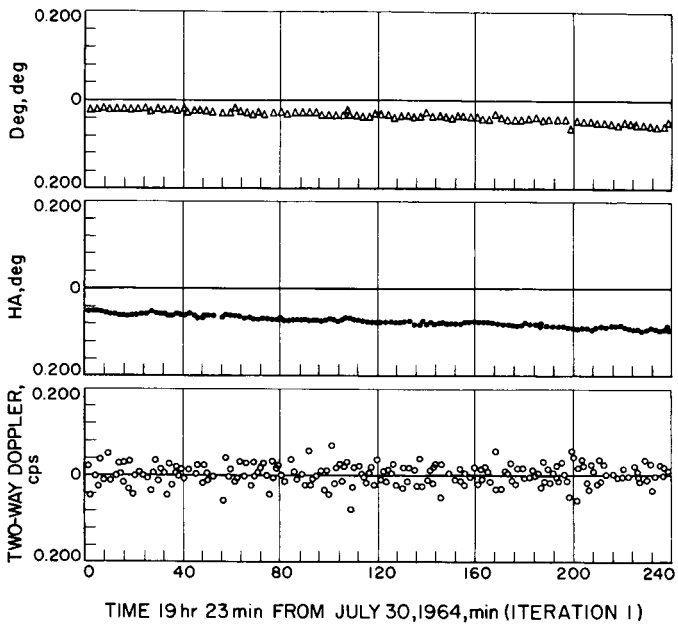

Fig. B-25. Station 41 residuals (start 19:23 GMT)

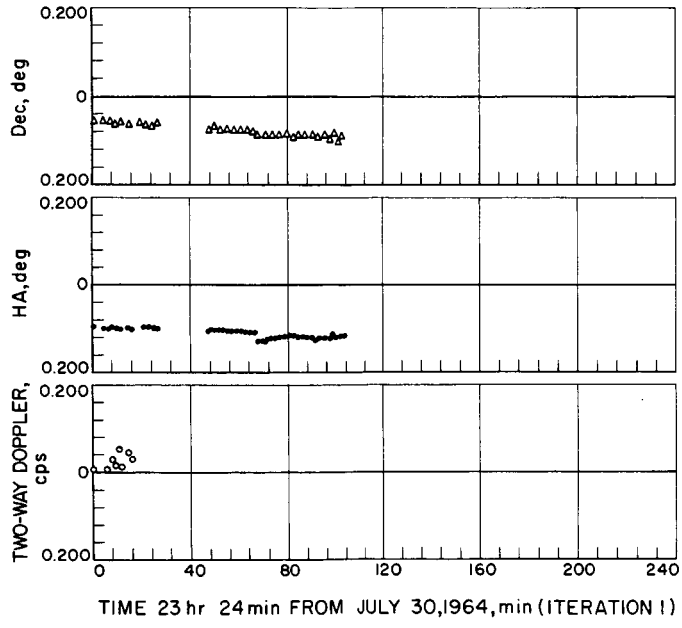

Fig. B-26. Station 41 residuals (start 23:24 GMT)

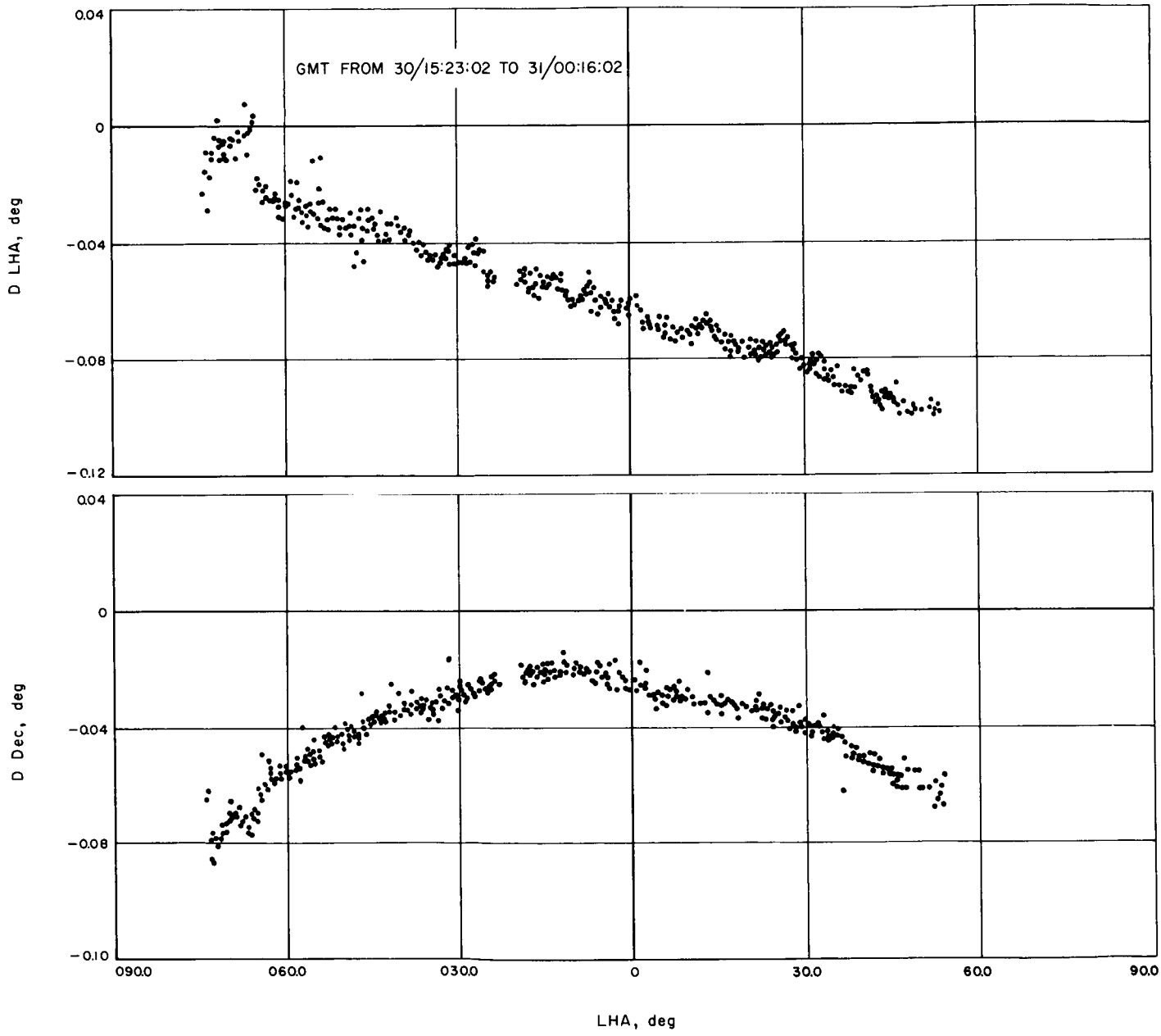

Fig. B-27. Station 41 residuals (start 15:23 GMT)

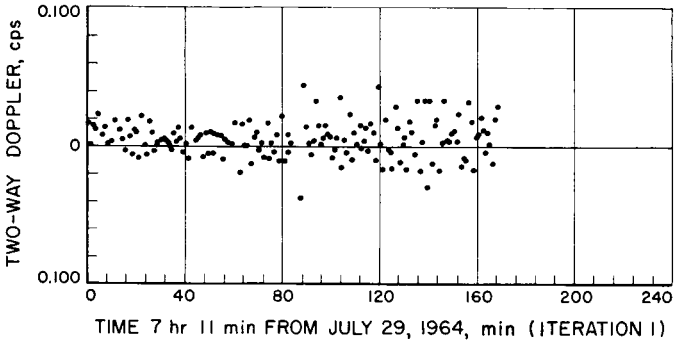

Fig. B-28. Station 12 residuals (start 07:11 GMT)

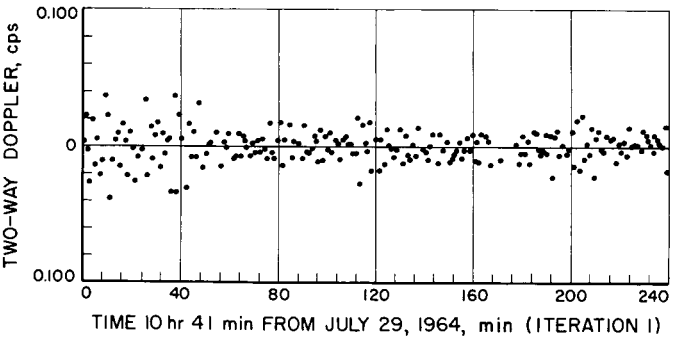

Fig. B-29. Station 12 residuals (start 10:41 GMT)

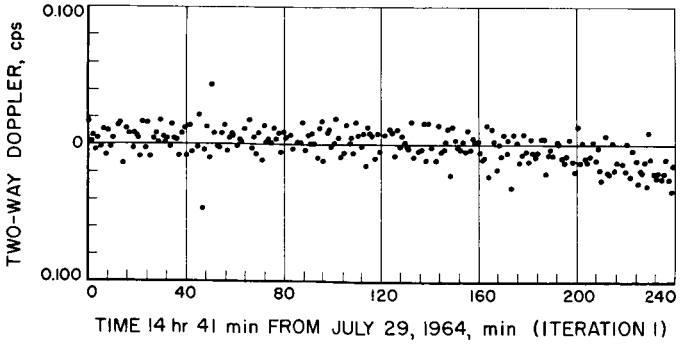

Fig. B-30. Station 12 residuals (start 14:41 GMT)

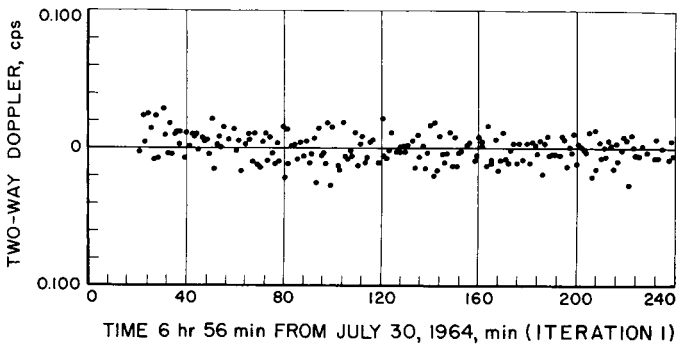

Fig. B-31. Station 12 residuals (start 06:56 GMT)

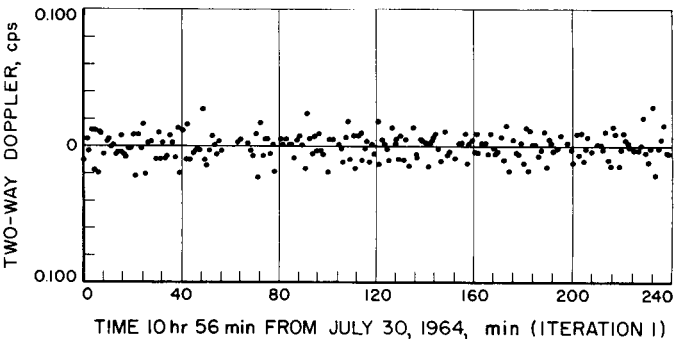

Fig. B-32. Station 12 residuals (start 10:56 GMT)

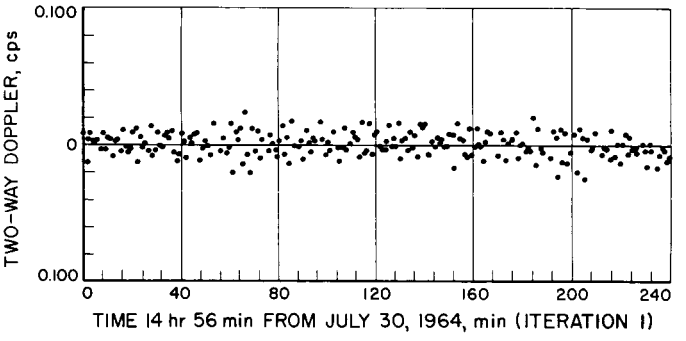

Fig. B-33. Station 12 residuals (start 14:56 GMT)

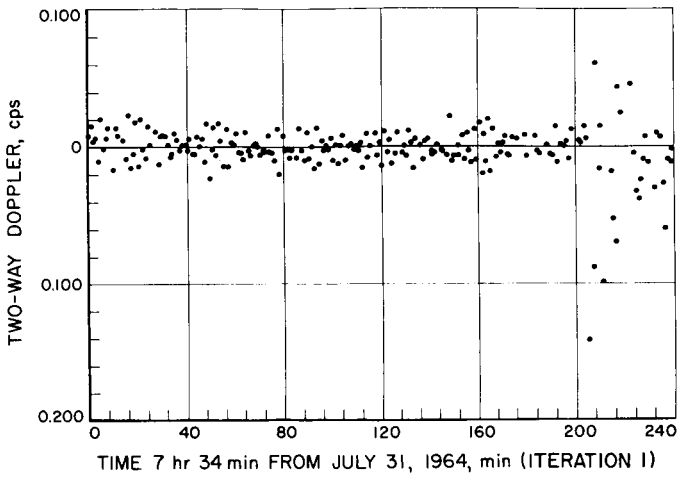

Fig. B-34. Station 12 residuals (start 07:34 GMT)

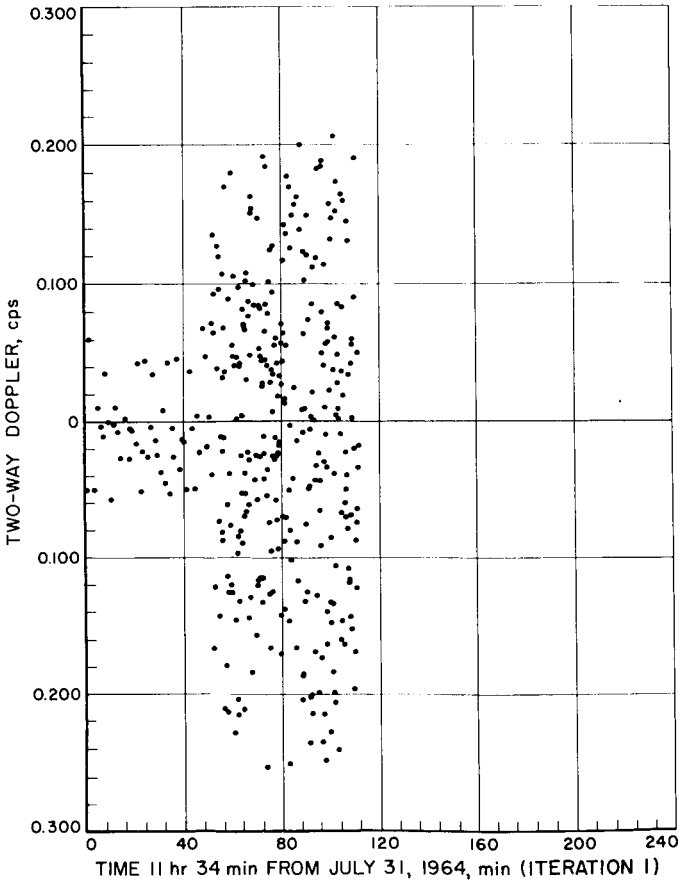

Fig. B-35. Station 12 residuals (start 11:34 GMT)

APPENDIX C

Hourly Trajectory Printout

SPACE TRAJECTORY
RA-7 POST MIDCOURSE ORBIT

GME	.39860138 06	J	.16234500-02	H	-.57499999-05	D	.78749999-05	RE	.63781650 04	REM	.63783085 04
G	.66709998-19	A	.88782497 29	B	.88800499 29	C	.88837498 29	OME	.41780741-02	AU	.14959900 09
GMM	.49025904 04	GMS	.13271544 12	GMV	.32476950 06	GMA	.42977799 05	GMC	.37918700 08	GMJ	.12671060 09
GM	.39860320 06	MGM	.49027779 04	JA	.29200000-02	HA	.00000000 00	DA	.00000000 00	RA	.34170000 04
AKA	.35670000 01	GB	.39225373 00	MAS	.37410000 03	GB1	.00000000 00	GB2	.00000000 00	SC	.10200000 09

INJECTION CONDITIONS MOON 2356669063532024000000000 J.D.= 2438605.93608796 JULY 29,1964 10 27 58.000

GEOCENTRIC	X0	.15667453 06	Y0	.63041615 05	Z0	.80777203 04	DX0	.14342616 01	DY0	.97256996 00	DZ0	.28116199 00
CARTESIAN	GMC	.00000000 00	SGC	.00000000 00	TU	.37678000 05	GHA	.10409373 03	GHD	.30667227 03		

0 DAYS 0 HRS. 0 MIN. 0.000 SEC. 2356665063532024000000000 J.D.= 2438605.93608796 JULY 29,1964 10 27 58.000
TFL 0 DAYS 17 HRS. 37 MIN. 50.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.15667452 06	Y	.63041612 05	Z	.80777203 04	DX	.14342615 01	DY	.97256991 00	DZ	.28116198 00
R	.16907513 06	DEC	.27384004 01	RA	.21918529 02	V	.17555769 01	PTH	.76231923 02	AZ	.61412702 02
R	.16907513 06	LAT	.27384004 01	LON	.27782479 03	VE	.12070410 02	PTE	.81207508 01	AZE	.27095862 03
XS	-.89949617 08	YS	.11227379 09	ZS	.48686774 08	DXS	-.23516068 02	DYS	-.16077728 02	DZS	-.69720238 01
XM	.38246393 06	YM	.27456505 05	ZM	-.26012535 05	DXM	-.83439957-01	DYM	.93230146 00	DZM	.40985471 00
XT	.38246393 06	YT	.27456505 05	ZT	-.26012535 05	DXT	-.83439957-01	DYT	.93230146 00	DZT	.40985471 00
RS	.15187738 09	VS	.29327596 02	RM	.38432950 06	VM	.10218264 01	RT	.38432950 06	VT	.10218264 01
GED	.27570333 01	ALT	.16269697 06	LOS	.24606686 02	RAS	.12870042 03	RAM	.41061312 01	LOM	.26001239 03
DUT	.35000000 02	DT	.48000000 03	DR	.17051340 01	SHA	.16335721 06	DES	.18697176 02	DEM	-.38809100 01

12 GOLDSTONE ECHO 1

R	.16907513 06	LAT	.27384004 01	LON	.27782479 03						
MIN	.00000000 00	HA	.32433873 03	DEC	.15353155 01	ELE	.42824939 02	AZI	.12738300 03		
CKC	.25687444 03	CKM	.35857767 03	CKT	.35857767 03	PSS	.10438720 03	PSM	.19549888 02		
UT	.00000000 00	DHA	.41684861-02	DDE	.84006325-04	DEL	.27731640-02	DAZ	.42421447-02		
ET	-.97222220-02	RGE	.16467917 06	DRG	.14853880 01	DDR	.89701509-05	SLS	.19642684 03		
RDI	.63718803 04	PHI	.35117429 02	THI	.24319447 03	SPS	.75552639 02	PUL	.69193435 02		
DT	.54931051 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09		
BF1	.54756779 05	F1	.83756779 05	F2	.10951356 06	XA	.29668358 08	PRA	.22949468 02		
D1	.27918926 04	D2	.36504519 04	DOP	.57448699-01	DF1	.28725846-01	DF2	.57451692-01		

GEOCENTRIC CONIC

EPOCH OF PERICENTER PASSAGE 2356664500620262624300000 J.D.= 2438605.21642545 JULY 28,1964 17 11 39.159

SMA	.24408704 06	ECC	.97401691 00	B	.55279675 05	SLR	.12519479 05	APO	.48183195 06	RCA	.63421337 04
VH	.14661112 00	C3	-.16330296 01	C1	.70641925 05	TEP	.62178840 05	TF	-.17271900 02	PER	.20002133 05
TA	.16192552 03	MTA	.00000000 00	EA	.71608143 02	MA	.18651663 02	C3J	-.20370907 01	TFI	.00000000 00

ALL VECTORS REFERENCED TO EARTH EQUATOR PLANE

X	.15667452 06	Y	.63041612 05	Z	.80777203 04	DX	.14342615 01	DY	.97256991 00	DZ	.28116198 00
INC	.28707647 02	LAN	.16908121 02	APF	.20378268 03	MX	-.34894883 00	MY	.80607917 00	MZ	.47795839 00
WX	.13970112 00	WY	-.43957629 00	WZ	.87708205 00	PX	-.77265537 00	PY	-.60455068 00	PZ	-.19376632 00
QX	.61926343 00	QY	-.69062115 00	QZ	-.43955049 00	RX	.15255774 00	RY	.11936613 00	RZ	-.98105955 00
BX	-.61926352 00	BY	.69062124 00	BZ	.43955055 00	TX	-.61622221 00	TY	.78757235 00	TZ	.00000000 00
LAP	-.11169161 02	RAP	.21804078 03								
PTQ	.49420872 05	BRQ	-.24767316 05	B	.55279675 05	THA	.33338222 03				

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.90106291 08	Y	-.11221875 09	Z	-.48678696 08	DX	.24950329 02	DY	.17050297 02	DZ	.72531858 01
R	.15192106 09	LAT	-.18688384 02	LON	.30876480 03	V	.31077971 02	PTH	-.21990050 00	AZ	.75813410 02
XE	.89949617 08	YE	-.11227379 09	ZE	-.48686774 08	DXE	.23516068 02	DYE	.16077728 02	DZE	.69720238 01
XT	.90332080 08	YT	-.11224633 09	ZT	-.48712787 08	DXT	.23432628 02	DYT	.17010029 02	DZT	.73818785 01
LTE	-.18697176 02	LOE	.30870042 03	LTT	-.18680127 02	LOT	.30842594 03	RST	.15209227 09	VST	.29861788 02
EPS	.74995021 02	ESP	.60570802-01	SEP	.10494337 03	EPM	.14723361 03	EMP	.13773993 02	MEP	.18992400 02
MPS	.13777124 03	MSP	.57674939-01	SMP	.42170245 02	SEM	.12393571 03	EMS	.55944169 02	ESM	.11992408 00
RPM	.23110452 06	SPN	.72833148 02								
GCE	.10159270 03	GCT	.28170323 03	SIP	.13734109 03	CPT	.92025115 02	SIN	.91594966 02	D1	.22522412 00
RLP	.16907513 06	VEP	.17555769 01	CPE	.97484314 02	CPS	.76877846 02	D2	.16777017 00	D3	.18667926-02

0 DAYS 0 HRS. 32 MIN. 2.000 SEC. 2356665073142020000000000 J.D.= 2438605.95833333 JULY 29,1964 11 00 00.000
TFL 0 DAYS 18 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.15940772 06	Y	.64901338 05	Z	.86168555 04	DX	.14100239 01	DY	.96267283 00	DZ	.27985067 00
R	.17232892 06	DEC	.28661198 01	RA	.22153230 02	V	.17300932 01	PTH	.76296971 02	AZ	.61421970 02
R	.17232891 06	LAT	.28661198 01	LON	.27002924 03	VE	.12307687 02	PTE	.78493600 01	AZE	.27092133 03
XS	-.89994810 08	YS	.11224288 09	ZS	.48673370 08	DXS	-.23509580 02	DYS	-.16085906 02	DZS	-.69755642 01
XM	.38229853 06	YM	.29247989 05	ZM	-.25224467 05	DXM	-.88665511-01	DYM	.93187746 00	DZM	.41019170 00
XT	.38229853 06	YT	.29247989 05	ZT	-.25224467 05	DXT	-.88665511-01	DYT	.93187746 00	DZT	.41019170 00
RS	.15187701 09	VS	.29327722 02	RM	.38424456 06	VM	.10220149 01	RT	.38424456 06	VT	.10220149 01
GED	.28856188 01	ALT	.16595076 06	LOS	.16598171 02	RAS	.12872216 03	RAM	.43749252 01	LOM	.25225093 03
DUT	.35000000 02	DT	.70000000 01	DR	.16808490 01	SHA	.16668788 06	DES	.18691886 02	DEM	-.37639968 01

12 GOLDSTONE ECHO 1

R	.17232891 06	LAT	.28661198 01	LON	.27002924 03						
MIN	.32033333 02	HA	.33236029 03	DEC	.16934165 01	ELE	.47843333 02	AZI	.13629824 03		
CKC	.25701906 03	CKM	.35873044 03	CKT	.35873044 03	PSS	.10434681 03	PSM	.19415500 02		
UT	.53388888 00	DHA	.41781658-02	DDE	.80522364-04	DEL	.24276756-02	DAZ	.50646926-02		
ET	.52416666 00	RGE	.16755229 06	DRG	.15351335 01	DDR	.11496207-04	SLS	.19657708 03		
RDI	.63718803 04	PHI	.35117429 02	THI	.24319447 03	SPS	.75591967 02	PUL	.75354438 02		
DT	.55889419 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09		
BF1	.54820012 05	F1	.83820011 05	F2	.10964002 06	XA	.29668360 08	PRA	.22958171 02		
D1	.27940004 04	D2	.36546674 04	DOP	.73626651-01	DF1	.36815243-01	DF2	.73630465-01		

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.90154217 08	Y	-.11217798 09	Z	-.48664754 08	DX	.24919604 02	DY	.17048579 02	DZ	.72554149 01
R	.15192083 09	LAT	-.18682863 02	LON	.30878784 03	V	.31052886 02	PTH	-.23016115 00	AZ	.75801189 02
XE	.89994810 08	YE	-.11224288 09	ZE	-.48673370 08	DXE	.23509580 02	DYE	.16085906 02	DZE	.69755642 01
XT	.90377108 08	YT	-.11221363 09	ZT	-.48698594 08	DXT	.23420415 02	DYT	.17017784 02	DZT	.73857559 01
LTE	-.18691886 02	LOE	.30872216 03	LTT	-.18674727 02	LOT	.30844605 03	RST	.15209035 09	VST	.29877979 02
EPS	.75236710 02	ESP	.63334395-01	SEP	.10470042 03	EPM	.14683203 03	EMP	.14203435 02	MEP	.18966531 02
MPS	.13793101 03	MSP	.57674939-01	SMP	.42011377 02	SEM	.12366484 03	EMS	.56214681 02	ESM	.12053439 00
RPM	.22824703 06	SPN	.73115674 02								
GCE	.10155816 03	GCT	.28171137 03	SIP	.13749547 03	CPT	.92066311 02	SIN	.91630477 02	D1	.22804898 00
RLP	.17232892 06	VEP	.17300932 01	CPE	.97518564 02	CPS	.76880056 02	D2	.17030464 00	D3	.19745277-02

0 DAYS 1 HRS. 32 MIN. 2.000 SEC. 2356665111202020000000000 J.D.= 2438606.00000000 JULY 29,1964 12 00 00.000

TFL 0 DAYS 19 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.16440563 06	Y	.6833460? 05	Z	.96198659 04	DX	.13671276 01	DY	.94484498 00	DZ	.27737749 00
R	.17830135 06	DEC	.30927711 01	RA	.22570019 02	V	.10848295 01	PTH	.76407959 02	AZ	.61440182 02
R	.17830134 06	LAT	.30927711 01	LON	.25540498 03	VE	.12742325 02	PTE	.73840781 01	AZE	.27085830 03
XS	-.90079426 08	YS	.11218494 09	ZS	.48648245 08	DXS	-.23497419 02	DYS	-.16101221 02	DZS	-.69821934 01
XM	.38196171 06	YM	.32601237 05	ZM	-.23746676 05	DXM	-.98456668-01	DYM	.93101702 00	DZM	.41079465 00
XT	.38196171 06	YT	.32601237 05	ZT	-.23746676 05	DXT	-.98456668-01	DYT	.93101702 00	DZT	.41079465 00
RS	.15187631 09	VS	.29327957 02	RM	.38408527 06	VM	.10223691 01	RT	.38408527 06	VT	.10223691 01
GED	.31138063 01	ALT	.17192320 06	LOS	.15378260 01	RAS	.12876209 03	RAM	.48784894 01	LOM	.23771343 03
LOT	.35000000 02	DT	.48000000 03	DR	.16376437 01	SHA	.17279896 06	DES	.18681968 02	DEM	-.35446624 01

12 GOLDSTONE ECHO 1

R	.1783C134 06	LAT	.30927711 01	LON	.25540458 03		
MIN	.92033333 02	HA	.34742429 03	DEC	.19718184 01	ELE	.54852370 02	AZI	.15779104 03
CKC	.25728635 03	CKM	.35901296 03	CKT	.35901296 03	PSS	.1C431377 03	PSM	.19125133 02
UT	.15338889 01	DHA	.41891875-02	DDE	.74185346-04	DEL	.13657696-02	DAZ	.68759248-02
ET	.15241666 01	RGE	.17305350 06	DRG	.15531066 01	DDR	.14E4C194-04	SLS	.19685768 03
RDI	.63718803 04	PHI	.35117429 02	THI	.24319447 03	SPS	.75622983 02	POL	.91827241 02
DT	.57724426 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.5497364C C5	F1	.83973639 05	F2	.10994728 06	XA	.29668365 08	PRA	.22935237 02
D1	.27991213 04	D2	.36649093 04	DOP	.95042980-01	DF1	.47523965-01	DF2	.95047930-01

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.90243831 08	Y	-.11211660 09	Z	-.48638625 08	DX	.24864527 02	DY	.17046066 02	DZ	.72595659 01
R	.15192036 09	LAT	-.18672521 02	LON	.30883095 03	V	.31C08295 02	PTH	-.24778048 00	AZ	.75778842 02
XE	.90079426 08	YE	-.11218494 09	ZE	-.48648245 08	DXE	.23497419 02	DYE	.16101221 02	DZE	.69821934 01
XT	.90461387 08	YT	-.11215234 09	ZT	-.48671991 08	DXT	.23398962 02	DYT	.17032238 02	DZT	.73929880 01
LTE	-.18681968 02	LOE	.30876289 03	LTT	-.18666610 02	LOT	.30888943 03	RST	.15208672 09	VST	.29870802 02
EPS	.75663672 02	ESP	.64860743-01	SEP	.10427116 03	EPM	.14611306 03	EMP	.15000673 02	MEP	.18886255 02
MPS	.13822273 03	MSP	.54625775-01	SMP	.41721304 02	SEM	.12315717 03	EMS	.56721691 02	ESM	.12073716 00
RPM	.22298172 06	SPN	.73613713 02								
GCE	.10149753 03	GCT	.28172660 03	SIP	.13777691 03	CPT	.9214C415 02	SIN	.91694597 02	D1	.23343427 00
REP	.1783C135 06	VEP	.16848295 01	CPE	.97578952 02	CPS	.76884183 02	D2	.17513480 00	D3	.20371406-02

0 DAYS 2 HRS. 32 MIN. 2.000 SEC. 2356665127242020000000000 J.C.= 2438606.04166666 JULY 29,1964 13 00 00.000

TFL 0 DAYS 20 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.16925438 06	Y	.71705244 05	Z	.10613922 05	DX	.13270945 01	DY	.92786726 00	DZ	.27487914 00
R	.18412317 06	DEC	.33046914 01	RA	.22960126 02	V	.16424604 01	PTH	.76506319 02	AZ	.61458143 02
R	.18412316 06	LAT	.33046914 01	LON	.24075400 03	VE	.13165987 02	PTE	.69675186 01	AZE	.27080284 03
XS	-.90163993 08	YS	.11212694 09	ZS	.48623100 08	DXS	-.23485247 02	DYS	-.16116528 02	DZS	-.69888195 01
XM	.38158964 06	YM	.35951214 05	ZM	-.22266786 05	DXM	-.1C825150 00	DYM	.93007006 00	DZM	.41136066 00
XT	.38158964 06	YT	.35951214 05	ZT	-.22266786 05	DXT	-.1C825150 00	DYT	.93007006 00	DZT	.41136066 00
RS	.15187562 09	VS	.29328192 02	RM	.38342571 06	VM	.1C227249 01	RT	.38392571 06	VT	.10227249 01
GED	.33271617 01	ALT	.17774903 06	LOS	.34459748 03	RAS	.12886360 03	RAM	.53821950 01	LOM	.22317607 03
LOT	.35000000 02	DT	.95999999 03	DR	.15971214 01	SHA	.17875290 06	DES	.18672043 02	DEM	-.33248857 01

12 GOLDSTONE ECHO 1

R	.18412316 06	LAT	.33046914 01	LON	.24075400 03		
MIN	.15203333 03	HA	.25116653 01	DEC	.22278583 01	ELE	.57C27670 02	AZI	.18461510 03
CKC	.25754010 03	CKM	.35928182 03	CKT	.35928182 03	PSS	.1C43C991 03	PSM	.18800265 02
UT	.25338889 01	DHA	.41912465-02	DDE	.68105484-04	DEL	-.2C788905-03	DAZ	.76868307-02
ET	.25241666 01	RGE	.17874492 06	DRG	.16096218 01	DDR	.16222C42-04	SLS	.19713874 03
RDI	.63718803 04	PHI	.35117429 02	THI	.24319447 03	SPS	.75624769 02	POL	.11368695 03
DT	.59622878 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.55154622 05	F1	.84154623 05	F2	.11030924 06	XA	.29668371 08	PRA	.22888932 02
D1	.28051541 04	D2	.36769748 04	DOP	.10389293 00	DF1	.51949169-01	DF2	.10389834 00

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.90333247 08	Y	-.11205524 09	Z	-.48612485 08	DX	.24812341 02	DY	.17044395 02	DZ	.72636986 01
R	.15191986 09	LAT	-.18662179 02	LON	.30887400 03	V	.30566514 02	PTH	-.26356846 00	AZ	.75757128 02
XE	.90163993 08	YE	-.11212694 09	ZE	-.48623100 08	DXE	.23485247 02	DYE	.16116528 02	DZE	.69888195 01
XT	.90545582 08	YT	-.11209099 09	ZT	-.48645366 08	DXT	.23376995 02	DYT	.17046598 02	DZT	.74001801 01
LTE	-.18672043 02	LOE	.30880360 03	LTT	-.18654485 02	LOT	.30893C81 03	RST	.15208308 09	VST	.29863574 02
EPS	.76C6C475 02	ESP	.67448792-01	SEP	.10387211 03	EPM	.14543370 03	EMP	.15788935 02	MEP	.18777364 02
MPS	.13850493 03	MSP	.53265584-01	SMP	.41440695 02	SEM	.12264908 03	EMS	.57229136 02	ESM	.12154476 00
RPM	.21782046 06	SPN	.74075360 02								
GCE	.10144165 03	GCT	.28174171 03	SIP	.13804855 03	CPT	.92212C82 02	SIN	.91755700 02	D1	.23896585 00
REP	.18412317 06	VEP	.16424604 01	CPE	.97634955 02	CPS	.76888305 02	D2	.18008231 00	D3	.21559957-02

0 DAYS 3 HRS. 32 MIN. 2.000 SEC. 2356665145302020000000000 J.C.= 2438606.08333333 JULY 29,1964 14 00 00.000

TFL 0 DAYS 21 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.17396379 06	Y	.75016180 05	Z	.11598995 05	DX	.12896489 01	DY	.91166095 00	DZ	.27238290 00
R	.1898C348 06	DEC	.35035592 01	RA	.23326539 02	V	.16C26579 01	PTH	.76593609 02	AZ	.61475714 02
R	.1898C348 06	LAT	.35035592 01	LON	.22607934 03	VE	.13579293 02	PTE	.65924421 01	AZE	.27075370 03
XS	-.90246523 08	YS	.11206890 09	ZS	.48597927 08	DXS	-.23473063 02	DYS	-.16131829 02	DZS	-.69954430 01
XM	.38118230 06	YM	.39297643 05	ZM	-.20784920 05	DXM	-.11804920 00	DYM	.92903650 00	DZM	.41188955 00
XT	.38118230 06	YT	.39297643 05	ZT	-.20784920 05	DXT	-.11804920 00	DYT	.92903650 00	DZT	.41188955 00
RS	.15187492 09	VS	.29328429 02	RM	.38376589 06	VM	.1C23C823 01	RT	.38376589 06	VT	.10230823 01
GED	.35273375C 01	ALT	.18342536 06	LOS	.33159713 03	RAS	.12B64432 03	RAM	.58866606 01	LOM	.20863887 03
LOT	.35000000 02	DT	.19200000 04	DR	.15589855 01	SHA	.18455933 06	DES	.18662108 02	DEM	-.31046812 01

12 GOLDSTONE ECHO 1

R	.1898C348 06	LAT	.35035592 01	LON	.22607934 03		
MIN	.21203333 03	HA	.17591534 02	DEC	.24625623 01	ELE	.53486734 02	AZI	.21049554 03
CKC	.25777052 03	CKM	.35952716 03	CKT	.35952716 03	PSS	.1C43C589 03	PSM	.18457974 02
UT	.35338889 01	DHA	.41892099-02	DDE	.62366644-04	DEL	-.16E6564C-02	DAZ	.64356332-02
ET	.35241666 01	RGE	.18464461 06	DRG	.16675025 01	DDR	.15E05444-04	SLS	.19742079 03
RDI	.63718803 04	PHI	.35117429 02	THI	.24319447 03	SPS	.75626633 02	POL	.13451656 03
DT	.61596736 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.55335972 05	F1	.84339973 05	F2	.11067994 06	XA	.29668376 08	PRA	.22850130 02
D1	.28113324 04	D2	.36893314 04	DOP	.99943971-01	DF1	.49974588-01	DF2	.99949176-01

```
41 WOOMERA                1
     R .1898C348 C6    LAT .35035592 01    LON .22807939 03
   MIN .21203333 03     HA .26915983 03    DEC .44973798 01    ELE-.30459519 01    AZI .86584736 02
   CKC .25898632 03    CKM .74296449 00    CKT .74296449 00    PSS .1C161331 03    PSM .19634064 02
    UT .35338889 01    DHA .40910569-02    DDE .54526985-04    DEL .34645205-02    DAZ-.21556969-02
    ET .35241666 01    RGE .19003539 06    DRG .11743862 01    DDR-.1C825119-04    SLS .19767076 03
   RDI .63726015 04    PHI-.31212263 02    THI .13688755 03    SPS .78316483 02    PCL .34902358 03
    DT .63388974 00    RFB .96004999 09    RF1 .96004999 09    RF2 .29668212 08     FA .96004999 09
   BF1 .5376C832 05     F1 .82760832 05     F2 .10752166 06     XA .29668327 08    PRA .24974910 02
    D1 .27586944 C4     D2 .35840555 04    DOP-.69328715-01    DF1-.34666163-01    DF2-.69332326-01

      HELICCENTRIC                                                                  EQUATORIAL COORDINATES

     X  .90422486 08      Y -.11199388 09      Z -.48586328 08    DX  .24762711 02    DY  .17043489 02    DZ  .72678259 01
     R  .15191934 09    LAT -.18651833 02    LON  .30891698 03     V  .30927232 02    PTH -.27776586 00     AZ  .75735978 02
    XE  .90248523 08     YE -.11206890 09     ZE -.48597927 08   DXE  .23473063 02    DYE  .16131829 02    DZE  .69954430 01
    XT  .90629705 08     YT -.11202960 09     ZT -.48618711 08   DXT  .23355013 02    DYT  .17060865 02    DZT  .74073325 01
   LTE -.18662108 02    LOE  .30884432 03    LTT -.18644352 02   LOT  .30897216 03    RST  .15207943 09    VST  .29856294 02
   EPS  .7643C556 02    ESP  .69590554-01    SEP  .10349983 03   EPM  .14479018 03    EMP  .16568524 02    MEP  .18641283 02
   MPS  .13877795 03    MSP  .51869734-01    SMP  .41169225 02   SEM  .12214056 03    EMS  .57737012 02    ESM  .12234704 00
   RPM  .21275348 06    SPN  .74504874 02
   GCE  .10138994 03    GCT  .28175664 03    SIP  .13831070 03   CPT  .92281153 02    SIN  .91813903 02     D1  .24465748 00
   REP  .1898C348 06    VEP  .16026579 01    CPE  .97687098 02   CPS  .76892424 02     D2  .18515833 00     D3  .22816190-02

   0 DAYS  4 HRS. 32 MIN.  2.000 SEC.        2356665163342020000000000 J.C.= 2438606.12500000  JULY 29,1964 15 00 00.000
                                             TFL    0 DAYS 22 HRS.  9 MIN. 52.127 SEC.

      GEOCENTRIC                                                                    EQUATORIAL COORDINATES

     X  .17854258 06      Y  .7827C055 05      Z  .12575091 05    DX  .12544880 01    DY  .89615705 00    DZ  .26989271 00
     R  .19535042 06    DEC  .36907926 01     RA  .23671835 02     V  .15651452 01    PTH  .76671138 02     AZ  .61492788 02
     R  .19535042 06    LAT  .36907926 01    LON  .21138357 03    VE  .13982806 02    PTE  .62529698 01    AZE  .27070989 03
    XS -.90333CC6 08     YS  .11201079 09     ZS  .48572730 08   DXS -.2346C866 02    DYS -.16147123 02    DZS -.70020634 01
    XM  .38C73968 06     YM  .42640193 05     ZM -.19301217 05   DXM -.12784884 00    DYM  .92791616 00    DZM  .41238119 00
    XT  .38073968 06     YT  .42640193 05     ZT -.19301217 05   DXT -.12784884 00    DYT  .92791616 00    DZT  .41238119 00
    RS  .15187422 09     VS  .29328667 02     RM  .38360582 06    VM  .10234412 01     RT  .38360582 06     VT  .10234412 01
   GED  .37158743 01    ALT  .18897230 06    LOS  .31659677 03   RAS  .12888503 03    RAM  .63901008 01    LOM  .19410184 03
   OUT  .35C0CCC0 02     DT  .19200000 04     DR  .15229847 01   SHA  .19022678 06    DES  .18652164 02    DEM -.28840670 01

12 GOLDSTONE ECHO         1
     R .19535042 06    LAT .36907926 01    LON .21138357 03
   MIN .27203333 03     HA .32637077 02    DEC .26772540 01    ELE .45638095 02    AZI .23039915 03
   CKC .25796942 03    CKM .35974075 03    CKT .35974075 03    PSS .10427615 03    PSM .18113182 02
    UT .45338888 01    DHA .41724369-02    DDE .57003609-04    DEL-.25854641-02    DAZ .46761896-02
    ET .45241666 01    RGE .19074411 06    DRG .17197293 01    DDR-.13117149-04    SLS .19770309 03
   RDI .63718803 04    PHI .35117429 02    THI .24319447 03    SPS .75654127 02    PCL .14913381 03
    DT .63625378 00    RFB .96004999 09    RF1 .96004999 09    RF2 .29668212 08     FA .96004999 09
   BF1 .555C7229 05     F1 .84507229 05     F2 .11101446 06     XA .29668381 08    PRA .22845654 02
    D1 .2816SC76 C4     D2 .37004820 04    DOP .84007856-01    DF1 .42006116-01    DF2 .84012230-01
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41 WOOMERA                1
     R .19535042 06    LAT .36907926 01    LON .21138357 03
   MIN .27203333 03     HA .28394917 03    DEC .46893961 01    ELE .93875921 01    AZI .78634814 02
   CKC .25907179 03    CKM .84311299 00    CKT .84311299 00    PSS .1C135185 03    PSM .19471001 02
    UT .45338888 01    DHA .41247265-02    DDE .52076737-04    DEL .34303610-02    DAZ-.22968118-02
    ET .45241666 01    RGE .19420977 06    DRG .11493534 01    DDR-.3096775C-05    SLS .19785949 03
   RDI .63726015 04    PHI-.31212263 02    THI .13688755 03    SPS .78576335 02    PCL .34738465 03
    DT .64781396 00    RFB .96004999 09    RF1 .96004999 09    RF2 .29668212 08     FA .96004999 09
   BF1 .5368C667 05     F1 .82680668 05     F2 .10736133 06     XA .29668325 08    PRA .25226635 02
    D1 .2756C222 04     D2 .35787112 04    DOP-.19833077-01    DF1-.9917C553-02    DF2-.19834111-01

      HELICCENTRIC                                                                  EQUATORIAL COORDINATES

     X  .90511548 08      Y -.11193252 09      Z -.48560154 08    DX  .24715354 02    DY  .17043280 02    DZ  .72719561 01
     R  .15191879 09    LAT -.18641486 02    LON  .30895991 03     V  .3089C1E4 02    PTH -.29057930 00     AZ  .75715329 02
    XE  .90333CC6 08     YE -.11201079 09     ZE -.48572730 08   DXE  .2346C866 02    DYE  .16147123 02    DZE  .70020634 01
    XT  .90713745 08     YT -.11196815 09     ZT -.48592031 08   DXT  .23333018 02    DYT  .17075039 02    DZT  .74144446 01
   LTE -.18652164 02    LOE  .30888503 03    LTT -.18634211 02   LOT  .30901351 03    RST  .15207575 09    VST  .29848964 02
   EPS  .76776811 02    ESP  .71668340-01    SEP  .10315144 03   EPM  .14417933 03    EMP  .17339760 02    MEP  .18480904 02
   MPS  .13904210 03    MSP  .51396029-01    SMP  .40906587 02   SEM  .12163162 03    EMS  .58245324 02    ESM  .12294532 00
   RPM  .20777211 06    SPN  .74905828 02
   GCE  .10134193 03    GCT  .28177132 03    SIP  .13856364 03   CPT  .92347755 02    SIN  .91869300 02     D1  .25052358 00
   REP  .19535042 06    VEP  .15651452 01    CPE  .97735821 02   CPS  .76896539 02     D2  .19037466 00     D3  .24145893-02

   0 DAYS  5 HRS. 32 MIN.  2.000 SEC.        2356665201402020000000000 J.C.= 2438606.16666666  JULY 29,1964 16 00 00.000
                                             TFL    0 DAYS 23 HRS.  9 MIN. 52.127 SEC.

      GEOCENTRIC                                                                    EQUATORIAL COORDINATES

     X  .18295855 06      Y  .81469281 05      Z  .13542239 05    DX  .12213724 01    DY  .88129487 00    DZ  .26741508 00
     R  .20077127 06    DEC  .38675988 01     RA  .23998192 02     V  .15296869 01    PTH  .76740012 02     AZ  .61509272 02
     R  .20077127 06    LAT  .38675988 01    LON  .19666887 03    VE  .14377040 02    PTE  .59442811 01    AZE  .27067062 03
    XS -.90417441 08     YS  .11195263 09     ZS  .48547513 08   DXS -.23448660 02    DYS -.16162410 02    DZS -.70086808 01
    XM  .38C26178 06     YM  .45978538 05     ZM -.17815819 05   DXM -.13764948 00    DYM  .92670896 00    DZM  .41283548 00
    XT  .38026178 06     YT  .45978538 05     ZT -.17815819 05   DXT -.13764948 00    DYT  .92670896 00    DZT  .41283548 00
    RS  .15187352 09     VS  .29328906 02     RM  .38344550 06    VM  .10238017 01     RT  .38344550 06     VT  .10238017 01
   GED  .38938749 01    ALT  .19439317 06    LOS  .30159641 03   RAS  .12892573 03    RAM  .68943288 01    LOM  .17956501 03
   OUT  .35C0CCC0 02     DT  .19200000 04     DR  .14889044 01   SHA  .19576297 06    DES  .18642213 02    DEM -.26630600 01

12 GOLDSTONE ECHO         1
     R .20077127 06    LAT .38675988 01    LON .19666887 03
   MIN .33203333 03     HA .47627031 02    DEC .28736082 01    ELE .35409993 02    AZI .24486382 03
   CKC .25813087 03    CKM .35991658 03    CKT .35991658 03    PSS .1C42C028 03    PSM .17777485 02
    UT .55338889 01    DHA .41546316-02    DDE .52175505-04    DEL-.30415489-02    DAZ .34636799-02
    ET .55241666 01    RGE .19701208 06    DRG .17600155 01    DDR .9C253878-05    SLS .19798393 03
   RDI .63718803 04    PHI .35117429 02    THI .24319447 03    SPS .75727689 02    PCL .15790426 03
    DT .65716146 00    RFB .96004999 09    RF1 .96004999 09    RF2 .29668212 08     FA .96004999 09
   BF1 .55636241 05     F1 .84636240 05     F2 .11127248 06     XA .29668486 08    PRA .22896763 02
    D1 .28212C80 C4     D2 .37090827 04    DOP .57802462-01    DF1 .28902736-01    DF2 .57805472-01
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41 WOOMERA                1
     R .20077127 06     LAT .38675988 01     LON .19666887 03
   MIN .33203333 03      HA .29885316 03     DEC .48717852 01     ELE .21544016 02     AZI .69758866 02
   CKC .25918808 03     CKM .97379330 00     CKT .97379330 00     PSS .10120104 03     PSM .19238617 02
    UT .55338889 01     DHA .41544847-02     DDE .49172410-04     DEL .33045629-02     DAZ-.26807907-02
    ET .55241666 01     RGE .19834363 06     DRG .11516752 01     DDR .42859225-05     SLS .19804243 03
   RDI .63726015 04     PHI-.31212263 02     THI .13688755 03     SPS .78725582 02     POL .34376046 03
    DT .6616C3C6 00     RFB .96004999 09     RF1 .96004999 09     RF2 .29668212 08      FA .96004999 09
   BF1 .53688103 05      F1 .82688102 05      F2 .10737621 06      XA .29668325 08     PRA .25363712 02
    D1 .275627C1 04      D2 .35792068 04     DOP .27448889-01     DF1 .13725159-01     DF2 .27450319-01

     HELICCENTRIC                                                                                  EQUATORIAL COORDINATES

     X  .9060C439 08      Y -.11187117 09      Z -.48533970 08     DX  .2467C032 02     DY  .170437C5 02     DZ  .7276C958 01
     R  .15191821 09    LAT -.18631137 02    LON  .30900277 03      V  .30855144 02    PTH -.30217440 00     AZ  .75695130 02
    XE  .90417441 08     YE -.11195263 09     ZE -.48547513 08    DXE  .23448660 02    DYE  .16162410 02    DZE  .70086808 01
    XT  .9079772 08      YT -.11190666 09     ZT -.48565328 08    DXT  .23311010 02    DYT  .17089119 02    DZT  .74215163 01
   LTE -.18642213 02     LOE  .30892573 03    LTT -.18624062 02    LOT  .30905484 03    RST  .15207206 09    VST  .29841583 02
   EPS  .77101699 02     ESP  .73354886-01    SEP  .10282446 03    EPM  .14359841 03    EMP  .18102899 02    MEP  .18298682 02
   MPS  .13929765 03     MSP  .49455853-01    SMP  .40652506 02    SEM  .12112225 03    EMS  .58754074 02    ESM  .12354070 00
   RPM  .20286869 06     SPN  .75281250 02
   GCE  .10129721 03     GCT  .28178570 03    SIP  .13880763 03    CPT  .92412007 02    SIN  .91921988 02     D1  .25657929 00
   REP  .20077127 06     VEP  .15296869 01    CPE  .97781494 02    CPS  .76900651 02     D2  .19574368 00     D3  .25555434-02

   0 DAYS  6 HRS. 32 MIN.  2.000 SEC.        2356665217442020000000000 J.D.= 2438606.20833333  JULY 29,1964 17 00 00.000
                                             TFL    1 DAYS  0 HRS.  9 MIN. 52.127 SEC.

     GEOCENTRIC                                                                                    EQUATORIAL COORDINATES

     X  .18733867 06      Y  .84616081 05      Z  .14500501 05     DX  .11900975 01     DY  .86702108 00     DZ  .26495469 00
     R  .20607261 06    DEC  .40350077 01     RA  .24307477 02      V  .14960810 01    PTH  .76801217 02     AZ  .61525092 02
     R  .20607261 06    LAT  .40350077 01    LON  .18193709 03     VE  .14762463 02    PTE  .56623864 01    AZE  .27063522 03
    XS -.90501837 08     YS  .11189442 09     ZS  .48522269 08    DXS -.23436440 02    DYS -.16177691 02    DZS -.70152955 01
    XM  .37974861 06     YM  .49312393 05     ZM -.16328846 05    DXM -.14745031 00    DYM  .92541480 00    DZM  .41325225 00
    XT  .37974861 06     YT  .49312393 05     ZT -.16328846 05    DXT -.14745031 00    DYT  .92541480 00    DZT  .41325225 00
    RS  .15187282 09     VS  .29329145 02     RM  .38328493 06     VM  .10241638 01     RT  .38328493 06     VT  .10241638 01
   GED  .40624136 01    ALT  .19969451 06    LOS  .28659604 03    RAS  .12896644 03    RAM  .73987634 01    LOM  .16502837 03
   DUT  .35000000 02     DT  .19200000 04     DR  .14565602 01    SHA  .20117479 06    DES  .18632251 02    DEM -.24416739 01

12 GOLDSTONE ECHO         1
     R .20607261 06     LAT .40350077 01     LON .18193709 03
   MIN .39203333 03      HA .62546632 02     DEC .30536367 01     ELE .24030126 02     AZI .25598048 03
   CKC .25825156 03     CKM .51286182-01     CKT .51286182-01     PSS .10406383 03     PSM .17459146 02
    UT .65338889 01     DHA .41336688-02     DDE .47945260-04     DEL-.32514203-02     DAZ .27848383-02
    ET .65241666 01     RGE .20339568 06     DRG .17832342 01     DDR .37041791-05     SLS .19826090 03
   RDI .63718803 04     PHI .35117429 02     THI .24319447 03     SPS .75861755 02     POL .16270147 03
    DT .67845486 00     RFB .96004999 09     RF1 .96004999 09     RF2 .29668212 08      FA .96004999 09
   BF1 .55710596 05      F1 .84710595 05      F2 .11142119 06      XA .29668388 08     PRA .23018228 02
    D1 .28236865 04      D2 .37140397 04     DOP .23723155-01     DF1 .11862195-01     DF2 .23724390-01
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41 WOOMERA                1
     R .20607261 06     LAT .40350077 01     LON .18193709 03
   MIN .39203333 03      HA .31385496 03     DEC .50428848 01     ELE .33004479 02     AZI .58928476 02
   CKC .25932772 03     CKM .11274516 01     CKT .11274516 01     PSS .10114557 03     PSM .18944328 02
    UT .65338889 01     DHA .41788394-02     DDE .45809615-04     DEL .30301443-02     DAZ-.34037577-02
    ET .65241666 01     RGE .20253212 06     DRG .11791771 01     DDR .10807642-04     SLS .19822395 03
   RDI .63726C15 04     PHI-.31212263 02     THI .13688755 03     SPS .78779481 02     POL .33747910 03
    DT .67557433 00     RFB .96004999 09     RF1 .96004999 09     RF2 .29668212 08      FA .96004999 09
   BF1 .53776175 05      F1 .82776175 05      F2 .10755235 06      XA .29668328 08     PRA .25402973 02
    D1 .27592058 04      D2 .35850783 04     DOP .69216781-01     DF1 .34610193-01     DF2 .69220386-01

     HELICCENTRIC                                                                                  EQUATORIAL COORDINATES

     X  .90689175 08      Y -.11180981 09      Z -.48507769 08     DX  .24626538 02     DY  .17044712 02     DZ  .72802502 01
     R  .15191762 09    LAT -.18620784 02    LON  .30904558 03      V  .30821917 02    PTH -.31269374 00     AZ  .75675335 02
    XE  .90501837 08     YE -.11189442 09     ZE -.48522269 08    DXE  .23436440 02    DYE  .16177691 02    DZE  .70152955 01
    XT  .90881585 08     YT -.11184511 09     ZT -.48538598 08    DXT  .23288990 02    DYT  .17103105 02    DZT  .74285477 01
   LTE -.18632251 02     LOE  .30896644 03    LTT -.18613905 02    LOT  .30905615 03    RST  .15206836 09    VST  .29834151 02
   EPS  .77407332 02     ESP  .75975525-01    SEP  .10251679 03    EPM  .14304508 03    EMP  .18858192 02    MEP  .18096717 02
   MPS  .13954486 03     MSP  .47949227-01    SMP  .40406728 02    SEM  .12061245 03    EMS  .59263261 02    ESM  .12433010 00
   RPM  .19803631 06     SPN  .75633731 02
   GCE  .10125544 03     GCT  .28179972 03    SIP  .13904288 03    CPT  .92474017 02    SIN  .91972041 02     D1  .26284067 00
   REP  .20607261 06     VEP  .14960810 01    CPE  .97824433 02    CPS  .76904761 02     D2  .20127861 00     D3  .27051848-02

   0 DAYS  7 HRS. 32 MIN.  2.000 SEC.        2356665235502020000000000 J.D.= 2438606.25000000  JULY 29,1964 18 00 00.000
                                             TFL    1 DAYS  1 HRS.  9 MIN. 52.127 SEC.

     GEOCENTRIC                                                                                    EQUATORIAL COORDINATES

     X  .19156925 06      Y  .87712479 05      Z  .15449939 05     DX  .11604872 01     DY  .85328818 00     DZ  .26251484 00
     R  .21126040 06    DEC  .41939102 01     RA  .24601293 02      V  .14641535 01    PTH  .76855586 02     AZ  .61540177 02
     R  .21126040 06    LAT  .41939102 01    LON  .16718984 03     VE  .15139502 02    PTE  .54039525 01    AZE  .27060317 03
    XS -.90586184 08     YS  .11183616 09     ZS  .48497006 08    DXS -.23424210 02    DYS -.16192964 02    DZS -.70219070 01
    XM  .3792C014 06     YM  .52641421 05     ZM -.14840447 05    DXM -.15725034 00    DYM  .92403358 00    DZM  .41363137 00
    XT  .3792C014 06     YT  .52641421 05     ZT -.14840447 05    DXT -.15725034 00    DYT  .92403358 00    DZT  .41363137 00
    RS  .15187212 09     VS  .29329386 02     RM  .38312414 06     VM  .10245275 01     RT  .38312414 06     VT  .10245275 01
   GED  .42223878 01    ALT  .20488231 06    LOS  .27159568 03    RAS  .12900713 03    RAM  .79034188 01    LOM  .15049197 03
   DUT  .35CCCCCC 02     DT  .19200000 04     DR  .14257926 01    SHA  .20646852 06    DES  .18622282 02    DEM -.22199767 01

12 GOLDSTONE ECHO         1
     R .21126040 06     LAT .41939102 01     LON .16718984 03
   MIN .45203333 03      HA .77387910 02     DEC .32195983 01     ELE .12159290 02     AZI .26533718 03
   CKC .25833087 03     CKM .14419853 00     CKT .14419853 00     PSS .10385467 03     PSM .17163105 02
    UT .75338888 01     DHA .41114249-02     DDE .44366968-04     DEL-.33262998-02     DAZ .24610788-02
    ET .75241666 01     RGE .20982644 06     DRG .17857344 01     DDR-.24087968-05     SLS .19853127 03
   RDI .63718803 04     PHI .35117429 02     THI .24319447 03     SPS .76064495 02     POL .16481883 03
    DT .6999C556 00     RFB .96004999 09     RF1 .96004999 09     RF2 .29668212 08      FA .96004999 09
   BF1 .55718603 05      F1 .84718602 05      F2 .11143721 06      XA .29668388 08     PRA .23218011 02
    D1 .28239534 04      D2 .37145735 04     DOP-.15426970-01     DF1-.77138866-02     DF2-.15427773-01
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41 WGOMERA              1
     R .21126040 06    LAT .41939102 01    LON .16718964 03
   MIN .45203333 03     HA .32893285 03    DEC .52011403 01    ELE .43045984 02    AZI .44685937 02
   CKC .25948167 C3    CKM .12950055 01    CKT .12950055 01    PSS .1C116555 03    PSM .18597726 02
    UT .75338888 01    DHA .41965861-02    DDE .42053744-04    DEL .24904396-02    DAZ-.45928708-02
    ET .75241666 01    RGE .20685922 06    DRG .12278754 01    DDR .1599C129-04    SLS .19840757 03
   RDI .63726015 04    PHI-.31212263 02    THI .13688755 03    SPS .78757908 02    POL .32732145 03
    DT .69000758 00    RFB .96004999 09    RF1 .96004999 09    RF2 .29668212 08     FA .96004999 09
   BF1 .53932138 05     F1 .82932137 05     F2 .10786428 06     XA .29668333 08    PRA .25366146 02
    D1 .27644046 04     D2 .35954759 04    DOP .10240765 00    DF1 .51206494-01    DF2 .10241299 00

      HELICCENTRIC                                                                          EQUATORIAL COORDINATES

     X  .90777753 08      Y -.11174844 09      Z -.48481556 08     DX  .24584697 02     DY  .17046252 02     DZ  .72844219 01
     R  .15191700 09    LAT -.1861C430 02    LON  .30908834 03      V  .30799337 02    PTH -.32225771 00     AZ  .75655904 02
    XE  .90586184 08     YE -.11183616 09     ZE -.48497006 08    DXE  .23424210 02    DYE  .16192964 02    DZE  .70219070 01
    XT  .90965364 08     YT -.11178351 09     ZT -.48511846 08    DXT  .23266960 02    DYT  .17116997 02    DZT  .74355384 01
   LTE -.18622282 02    LOE  .30900713 03    LTT -.18603742 02    LOT  .30913745 03    RST  .15206464 09    VST  .29826670 02
   EPS  .77695523 02    ESP  .77252514-01    SEP  .10222660 03    EPM  .14251729 03    EMP  .19605873 02    MEP  .17876834 02
   MPS  .13976396 03    MSP  .45863470-01    SMP  .40169020 02    SEM  .12010222 03    EMS  .59772886 02    ESM  .12433010 00
   MPM  .19326682 06    SPN  .75965488 02
   GCE  .10121633 03    GCT  .28181332 03    SIP  .13926960 03    CPT  .92533887 02    SIN  .92019528 02     D1  .26932486 00
   REP  .21126040 06    VEP  .14641535 01    CPE  .97864467 02    CPS  .76908872 02     D2  .20699356 00     D3  .28642940-02

    0 DAYS  8 HRS. 32 MIN.  2.000 SEC.        2356665253542020000000000 J.C.= 2438606.29166666  JULY 29,1964 19 00 00.000
                                                TFL    1 DAYS  2 HRS.  9 MIN. 52.127 SEC.

      GEOCENTRIC                                                                            EQUATORIAL COORDINATES

     X  .19565599 06      Y  .90760355 05      Z  .16390637 05     DX  .11323896 01     DY  .84005402 00     DZ  .26009777 00
     R  .21634005 06    DEC  .43450812 01     RA  .24881040 02      V  .14337530 01    PTH  .76903872 02     AZ  .61554469 02
     R  .21634005 06    LAT  .43450812 01    LON  .15242852 03     VE  .15508551 02    PTE  .51661792 01    AZE  .27057403 03
    XS -.90677492 08     YS  .11177783 09     ZS  .48471713 08    DXS -.23411967 02    DYS -.16208232 02    DZS -.70285160 01
    XM  .37861640 06     YM  .55965333 05     ZM -.13350744 05    DXM -.16704875 00    DYM  .92256521 00    DZM  .41397271 00
    XT  .37861640 06     YT  .55965333 05     ZT -.13350744 05    DXT -.16704875 00    DYT  .92256521 00    DZT  .41397271 00
    RS  .15187142 09     VS  .29329627 02     RM  .38296311 06     VM  .10248928 01     RT  .38296311 06     VT  .10248928 01
   GED  .43745773 01    ALT  .20996196 06    LOS  .25659530 03    RAS  .12904782 03    RAM  .84083144 01    LOM  .13595579 03
   OUT  .35000000 02     DT  .19200000 04     DR  .13964630 01    SHA  .21164985 06    DES  .18612304 02    DEM -.19978320 01

12 GOLDSTONE ECHO       1
     R .21634005 06    LAT .43450812 01    LON .15242852 03
   MIN .51203333 03     HA .92149450 02    DEC .33738880 01    ELE .18498969 00    AZI .27399546 03
   CKC .25837072 03    CKM .19718158 00    CKT .19718158 00    PSS .1C358272 03    PSM .16891270 02
    UT .85338888 01    DHA .40896409-02    DDE .41460871-04    DEL-.33132085-02    DAZ .23857205-02
    ET .85241666 01    RGE .21622561 06    DRG .17654949 01    DDR-.88521022-05    SLS .19879221 03
   RDI .63718803 04    PHI .35117429 02    THI .24319447 03    SPS .76338005 02    POL .16489449 03
    DT .72125091 00    RFB .96004999 09    RF1 .96004999 09    RF2 .29668212 08     FA .96004999 09
   BF1 .55653787 05     F1 .84653788 05     F2 .11130757 06     XA .29668386 08    PRA .23497539 02
    D1 .28217929 04     D2 .37102525 04    DOP-.56692666-01    DF1-.28347809-01    DF2-.56695618-01
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41 WGOMERA              1
     R .21634005 06    LAT .43450812 01    LON .15242852 03
   MIN .51203333 03     HA .34406151 03    DEC .53453538 01    ELE .5040C855 02    AZI .25400264 02
   CKC .25964002 03    CKM .14664800 01    CKT .14664800 01    PSS .10123762 03    PSM .18210112 02
    UT .85338888 01    DHA .42069557-02    DDE .38033972-04    DEL .15C79704-02    DAZ-.61310120-02
    ET .85241666 01    RGE .21139167 06    DRG .12922286 01    DDR .19445997-04    SLS .19859583 03
   RDI .63726015 04    PHI-.31212263 02    THI .13688755 03    SPS .78664182 02    POL .31182820 03
    DT .70512662 00    RFB .96004999 09    RF1 .96004999 09    RF2 .29668212 08     FA .96004999 09
   BF1 .54138209 05     F1 .83138209 05     F2 .10827642 06     XA .29668339 08    PRA .25278560 02
    D1 .27712736 04     D2 .36092139 04    DOP .12454052 00    DF1 .62273502-01    DF2 .12454700 00

      HELICCENTRIC                                                                          EQUATORIAL COORDINATES

     X  .90866187 08      Y -.11168707 09      Z -.48455322 08     DX  .24544357 02     DY  .17048286 02     DZ  .72886138 01
     R  .15191637 09    LAT -.18600071 02    LON  .30913106 03      V  .30760256 02    PTH -.33096620 00     AZ  .75636808 02
    XE  .90676492 08     YE -.11177783 09     ZE -.48471713 08    DXE  .23411967 02    DYE  .16208232 02    DZE  .70285160 01
    XT  .91049108 08     YT -.11172187 09     ZT -.48485063 08    DXT  .23244919 02    DYT  .17130797 02    DZT  .74424887 01
   LTE -.18612304 02    LOE  .30904783 03    LTT -.18593568 02    LOT  .30917874 03    RST  .15206090 09    VST  .29819139 02
   EPS  .77967853 02    ESP  .79437864-01    SEP  .10195232 03    EPM  .14201324 03    EMP  .20346149 02    MEP  .17640606 02
   MPS  .14601517 03    MSP  .45863470-01    SMP  .39939174 02    SEM  .11959157 03    EMS  .60282952 02    ESM  .12511453 00
   MPM  .18856C65 06    SPN  .76278452 02
   GCE  .10117962 03    GCT  .28182645 03    SIP  .13948796 03    CPT  .92591713 02    SIN  .92064511 02     D1  .27605018 00
   REP  .21634005 06    VEP  .14337530 01    CPE  .97903151 02    CPS  .76912979 02     D2  .21290362 00     D3  .30337361-02

    0 DAYS  9 HRS. 32 MIN.  2.000 SEC.        2356665271602020000000000 J.C.= 2438606.33333333  JULY 29,1964 20 00 00.000
                                                TFL    1 DAYS  3 HRS.  9 MIN. 52.127 SEC.

      GEOCENTRIC                                                                            EQUATORIAL COORDINATES

     X  .19972411 06      Y  .93761433 05      Z  .17322677 05     DX  .11056719 01     DY  .82728073 00     DZ  .25770492 00
     R  .22131652 06    DEC  .44891930 01     RA  .25147932 02      V  .14C47475 01    PTH  .76946732 02     AZ  .61567906 02
     R  .22131651 06    LAT  .44891930 01    LON  .13765435 03     VE  .15869971 02    PTE  .49466927 01    AZE  .27054742 03
    XS -.90754758 08     YS  .11171945 09     ZS  .48446398 08    DXS -.23399713 02    DYS -.16223493 02    DZS -.70351222 01
    XM  .37799739 06     YM  .59283806 05     ZM -.11859880 05    DXM -.17684459 00    DYM  .92100962 00    DZM  .41427614 00
    XT  .37799739 06     YT  .59283806 05     ZT -.11859880 05    DXT -.17684459 00    DYT  .92100962 00    DZT  .41427614 00
    RS  .15187072 09     VS  .29329869 02     RM  .38280185 06     VM  .10252597 01     RT  .38280185 06     VT  .10252597 01
   GED  .45196596 01    ALT  .21493844 06    LOS  .24159493 03    RAS  .12908852 03    RAM  .89134642 01    LOM  .12141988 03
   OUT  .35000000 02     DT  .19200000 04     DR  .13684496 01    SHA  .21672400 06    DES  .18602315 02    DEM -.17754086 01

41 WGOMERA              1
     R .22131651 06    LAT .44891930 01    LON .13765435 03
   MIN .57203333 03     HA .35921378 03    DEC .54748815 01    ELE .53305167 02    AZI .13100579 01
   CKC .25979270 03    CKM .16317599 01    CKT .16317599 01    PSS .1C133659 03    PSM .17793764 02
    UT .95338888 01    DHA .42097194-02    DDE .33927401-04    DEL .48378313-04    DAZ-.70112252-02
    ET .95241666 01    RGE .21617401 06    DRG .13655111 01    DDR .2C924575-04    SLS .19879014 03
   RDI .63726015 04    PHI-.31212263 02    THI .13688755 03    SPS .78583472 02    POL .29137238 03
    DT .72107878 00    RFB .96004999 09    RF1 .96004999 09    RF2 .29668212 08     FA .96004999 09
   BF1 .54372887 05     F1 .83372886 05     F2 .10874577 06     XA .29668346 08    PRA .25167352 02
    D1 .27790962 04     D2 .36248591 04    DOP .13400997 00    DF1 .67C08474-01    DF2 .13401695 00
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HELIOCENTRIC — EQUATORIAL COORDINATES

X	.90954482 08	Y	-.11162569 09	Z	-.48429075 08	DX	.24505385 02	DY	.17050773 02	DZ	.72928771 01
R	.15191572 09	LAT	-.18589708 02	LON	.30917372 03	V	.30731548 02	PTH	-.33890459 00	AZ	.75618015 02
XE	.90754758 08	YE	-.11171945 09	ZE	-.48446358 08	DXE	.23399713 02	DYE	.16223493 02	DZE	.70351222 01
XT	.91132755 08	YT	-.11166017 09	ZT	-.48458258 08	DXT	.23222868 02	DYT	.17144502 02	DZT	.74493983 01
LTE	-.18602315 02	LOE	.30908851 03	LTT	-.18583388 02	LOT	.30922001 03	RST	.15205714 09	VST	.29811560 02
EPS	.78225692 02	ESP	.81564685-01	SEP	.10169257 03	EPM	.14153138 03	EMP	.21079211 02	MEP	.17389402 02
MPS	.14023869 03	MSP	.43678226-01	SMP	.39716989 02	SEM	.11908048 03	EMS	.60793459 02	ESM	.12569964 00
RPM	.1839C675 C6	SPN	.76574288 02								
GCE	.10114510 C3	GCT	.28183905 03	SIP	.13969814 03	CPT	.92647582 02	SIN	.92107038 02	D1	.28303646 00
KEP	.22131652 06	VEP	.14047475 01	CPE	.97939365 02	CPS	.76917087 02	D2	.21902519 00	D3	.32144777-02

0 DAYS 10 HRS. 32 MIN. 2.000 SEC. 2356665307642020000000C0 J.C.= 2438606.37500000 JULY 29,1964 21 00 00.000
TFL 1 DAYS 4 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.20365835 06	Y	.96717294 05	Z	.18246145 05	DX	.10802188 01	DY	.81493437 00	DZ	.25533709 00
R	.22619434 06	DEC	.46268366 01	RA	.25403030 02	V	.13770213 01	PTH	.76984781 02	AZ	.61580431 02
R	.22619434 06	LAT	.46268366 01	LON	.12286838 03	VE	.16224096 02	PTE	.47434767 01	AZE	.27052302 03
XS	-.90838971 08	YS	.11166102 09	ZS	.48421061 08	DXS	-.23387447 02	DYS	-.16238746 02	DZS	-.70417250 01
XM	.37734312 06	YM	.62596504 05	ZM	-.10367959 05	DXM	-.18663689 00	DYM	.91936672 00	DZM	.41454157 00
XT	.37734312 06	YT	.62596504 05	ZT	-.10367999 05	DXT	-.18663689 00	DYT	.91936672 00	DZT	.41454157 00
RS	.15187001 09	VS	.29330111 02	RM	.38264036 06	VM	.10256282 01	RT	.38264036 06	VT	.10256282 01
GEO	.46582292 01	ALT	.21981627 06	LCS	.22659455 03	RAS	.12912920 03	RAM	.94188824 01	LOM	.10688423 03
DUT	.35000000 02	DT	.19200000 04	DR	.13416460 01	SHA	.22169572 06	DES	.18592319 02	DEM	-.15526710 01

41 WOOMERA 1

R	.22619434 06	LAT	.46268366 01	LON	.12286838 03				
MIN	.63203333 03	HA	.14362746 02	DEC	.55897695 01	ELE	.50724045 02	AZI	.33704660 03
CKC	.25993032 03	CKM	.17813983 01	CKT	.17813983 01	PSS	.10143728 03	PSM	.17361017 02
UT	.10533889 02	DHA	.42052222-02	CDE	.29935403-04	DEL	-.14307864-02	DAZ	-.62129881-02
ET	.10524167 02	RGE	.22122529 06	DRG	.14404041 01	DDR	.20341221-04	SLS	.19899077 03
RDI	.63726015 04	PHI	-.31212263 02	THI	.13688755 03	SPS	.78480434 02	POL	.27070329 03
DT	.73792805 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.54612723 05	F1	.83612723 05	F2	.10922545 06	XA	.29668354 08	PRA	.25059449 02
D1	.27870907 04	D2	.36408482 04	DOP	.13027392 00	DF1	.65140351-01	DF2	.13028070 00

51 JOBURG 85 FT. 1

R	.22619434 06	LAT	.46268366 01	LON	.12286838 03				
MIN	.63203333 03	HA	.26336711 03	DEC	.53113070 01	ELE	-.82677782 01	AZI	.88063785 02
CKC	.25903933 03	CKM	.89040053 00	CKT	.89040053 00	PSS	.99854021 02	PSM	.17779031 02
UT	.10533889 02	DHA	.41052031-02	CDE	.42768452-04	DEL	.36775002-02	DAZ	-.18037141-02
ET	.10524167 02	RGE	.22702312 06	DRG	.93557236 00	DDR	-.10732734-04	SLS	.19921542 03
RDI	.63754784 04	PHI	-.25739277 02	THI	.27685332 02	SPS	.80061617 02	POL	.35465598 03
DT	.75726752 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.52996060 05	F1	.81996059 05	F2	.10599217 06	XA	.29668304 08	PRA	.26852867 02
D1	.27332019 04	D2	.35330706 04	DOP	-.68737037-01	DF1	-.34370109-01	DF2	-.68740617-01

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.91042629 08	Y	-.11156430 09	Z	-.48402815 08	DX	.24467666 02	DY	.17053680 02	DZ	.72970621 01
R	.15191506 09	LAT	-.18579344 02	LON	.30921635 03	V	.30704100 02	PTH	-.34615057 00	AZ	.75599502 02
XE	.90838971 08	YE	-.11166102 09	ZE	-.48421061 08	DXE	.23387447 02	DYE	.16238746 02	DZE	.70417250 01
XT	.91216314 08	YT	-.11159842 09	ZT	-.48431429 08	DXT	.23200810 02	DYT	.17158113 02	DZT	.74562666 01
LTE	-.18592319 02	LOE	.30912920 03	LTT	-.18573201 02	LOT	.30926126 03	RST	.15205337 09	VST	.29803931 02
EPS	.7847C248 02	ESP	.83637439-01	SEP	.10144614 03	EPM	.14107033 03	EMP	.21805239 02	MEP	.17124426 02
MPS	.14045469 03	MSP	.41964682-01	SMP	.39502291 02	SEM	.11856896 03	EMS	.61304413 02	ESM	.12647557 00
RPM	.1793C253 06	SPN	.76854464 02								
GCE	.10111257 03	GCT	.28185106 03	SIP	.13990026 03	CPT	.92701580 02	SIN	.92147154 02	D1	.29030509 00
KEP	.22619434 06	VEP	.13770213 01	CPE	.97973726 02	CPS	.76921193 02	D2	.22537591 00	D3	.34075966-02

0 DAYS 11 HRS. 32 MIN. 2.000 SEC. 2356665325702020C0000000 J.C.= 2438606.41666666 JULY 29,1964 22 00 00.000
TFL 1 DAYS 5 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.20750307 06	Y	.99629437 05	Z	.19161136 05	DX	.10559285 01	DY	.80298441 00	DZ	.25299464 00
R	.23097770 06	DEC	.47585338 01	RA	.25647280 02	V	.13504722 01	PTH	.77018547 02	AZ	.61591983 02
R	.23097770 06	LAT	.47585347 01	LON	.10807157 03	VE	.16571234 02	PTE	.45547790 01	AZE	.27050059 03
XS	-.90923149 08	YS	.11160253 09	ZS	.48395699 08	DXS	-.23375169 02	DYS	-.16253994 02	DZS	-.70483252 01
XM	.37665362 06	YM	.65903145 05	ZM	-.88752241 04	DXM	-.19642483 00	DYM	.91763643 00	DZM	.41476883 00
XT	.37665362 06	YT	.65903145 05	ZT	-.88752241 04	DXT	-.19642483 00	DYT	.91763643 00	DZT	.41476883 00
RS	.15186931 09	VS	.29330355 02	RM	.38247867 06	VM	.10259983 01	RT	.38247867 06	VT	.10259983 01
GED	.47908126 01	ALT	.22459964 06	LCS	.21159416 03	RAS	.12916988 03	RAM	.99245888 01	LOM	.92348877 02
DUT	.35000000 02	DT	.19200000 04	DR	.13159579 01	SHA	.22656940 06	DES	.18582313 02	DEM	-.13296380 01

41 WOOMERA 1

R	.23097770 06	LAT	.47585347 01	LON	.10807157 03				
MIN	.69203333 03	HA	.29483699 02	DEC	.56907940 01	ELE	.43585759 02	AZI	.31745803 03
CKC	.26004490 03	CKM	.19073495 01	CKT	.19073495 01	PSS	.10151641 03	PSM	.16923408 02
UT	.11533889 02	DHA	.41943424-02	CDE	.26256845-04	DEL	-.24467989-02	DAZ	-.46681302-02
ET	.11524166 02	RGE	.22653805 06	DRG	.15095932 01	DDR	.17784372-04	SLS	.19919689 03
RDI	.63726015 04	PHI	-.31212263 02	THI	.13688755 03	SPS	.78399866 02	POL	.25478338 03
DT	.75564948 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.54834293 05	F1	.83834293 05	F2	.10966859 06	XA	.29668361 08	PRA	.24979562 02
D1	.27944764 04	D2	.36556195 04	DOP	.11389876 00	DF1	.56952347-01	DF2	.11390469 00

51 JOHURG 85 FT. 1

R	.23097770 06	LAT	.47585347 01	LON	.10807157 03				
MIN	.69203333 03	HA	.27819873 03	DEC	.54632352 01	ELE	.49638843 01	AZI	.81490981 02
CKC	.25916180 03	CKM	.96424171 00	CKT	.96424171 00	PSS	.99646398 02	PSM	.17536820 02
UT	.11533889 02	DHA	.41343592-02	CDE	.41541114-04	DEL	.36646168-02	DAZ	-.18806321-02
ET	.11524166 02	RGE	.23033870 06	DRG	.91118251 00	DDR	-.27978411-05	SLS	.19934141 03
RDI	.63754784 04	PHI	-.25739277 02	THI	.27685332 02	SPS	.80267955 02	POL	.35343556 03
DT	.76832709 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.52911554 05	F1	.81917953 05	F2	.10583591 06	XA	.29668301 08	PRA	.27062310 02
D1	.27305984 04	D2	.35278636 04	DOP	-.17918577-01	DF1	-.89597549-02	DF2	-.17919510-01

HELIOCENTRIC EQUATORIAL COORDINATES

X	.91136652 08	Y	-.11150290 09	Z	-.48376537 08	DX	.24431098 02	DY	.17056978 02	DZ	.73013198 01
R	.15191439 09	LAT	-.18568973 02	LON	.30925892 03	V	.30677814 02	PTH	-.35276305 00	AZ	.75581247 02
XE	.90923149 08	YE	-.11160253 09	ZE	-.48395699 08	DXE	.23375169 02	DYE	.16253994 02	DZE	.70483752 01
XT	.91299802 08	YT	-.11153663 09	ZT	-.48404574 08	DXT	.23178744 02	DYT	.17171630 02	DZT	.74630941 01
LTE	-.18582313 02	LOE	.30916988 03	LTT	-.18563005 02	LOT	.30930250 03	RST	.15204958 09	VST	.29796255 02
EPS	.78702584 02	ESP	.85374042-01	SEP	.10121196 03	EPM	.14062886 03	EMP	.22524390 02	MEP	.16846747 02
MPS	.14066334 03	MSP	.41377734-01	SMP	.39294916 02	SEM	.11805700 03	EMS	.61815809 02	ESM	.12705441 00
RPM	.17474383 06	SPN	.77122272 02								
GCE	.10108187 03	GCT	.28186243 03	SIP	.14009445 03	CPT	.92753785 02	SIN	.92184895 02	D1	.29787928 00
KEP	.23097770 06	VEP	.13504722 01	CPE	.98006390 02	CPS	.76925299 02	D2	.23197501 00	D3	.36143009-02

0 DAYS 12 HRS. 32 MIN. 2.000 SEC. 2356665343742020000000000 J.D.= 2438606.45833333 JULY 29,1964 23 00 00.000
TFL 1 DAYS 6 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC EQUATORIAL COORDINATES

X	.21126231 06	Y	.10249923 06	Z	.20067741 05	DX	.10327114 01	DY	.79140314 00	DZ	.25067751 00
R	.23567047 06	DEC	.48847480 01	RA	.25881511 02	V	.13250098 01	PTH	.77048539 02	AZ	.61602507 02
R	.23567047 06	LAT	.48847480 01	LON	.93264735 02	VE	.16911672 02	PTE	.43791194 01	AZE	.27047990 03
XS	-.91007280 08	YS	.11154399 09	ZS	.48370311 08	DXS	-.23362880 02	DYS	-.16269235 02	DZS	-.70549224 01
XM	.37592887 06	YM	.69203399 05	ZM	-.73817001 04	DXM	-.20620743 00	DYM	.91581871 00	DZM	.41495783 00
XT	.37592887 06	YT	.69203399 05	ZT	-.73817001 04	DXT	-.20620743 00	DYT	.91581871 00	DZT	.41495783 00
RS	.15186860 09	VS	.29330600 02	RM	.38231677 06	VM	.10263700 01	RT	.38231677 06	VT	.10263700 01
GED	.49178738 01	ALT	.22929242 06	LOS	.19659378 03	RAS	.12921056 03	RAM	.10430599 02	LOM	.77813820 02
DUT	.35000000 02	DT	.19200000 04	DR	.12913019 01	SHA	.23134909 06	DES	.18572298 02	DEM	-.11063242 01

41 WOOMERA 1

R	.23567047 06	LAT	.48847480 01	LON	.93264735 02				
MIN	.75203333 03	HA	.44555895 02	DEC	.57794046 01	ELE	.33651771 02	AZI	.30301116 03
CKC	.26013047 03	CKM	.20035749 01	CKT	.20035749 01	PSS	.10155417 03	PSM	.16490844 02
UT	.12533889 02	DHA	.41783822-02	DDE	.23063703-04	DEL	-.30126582-02	DAZ	-.34413566-02
ET	.12524167 02	RGE	.23207942 06	DRG	.15663733 01	DDR	.13499721-04	SLS	.19940680 03
RDI	.63726015 04	PHI	-.31212263 02	THI	.13688755 03	SPS	.78360068 02	PGL	.24420784 03
DT	.77413350 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.55016124 05	F1	.84016123 05	F2	.11003225 06	XA	.29668367 08	PRA	.24948427 02
D1	.28005374 04	D2	.36677416 04	DOP	.86458011-01	DF1	.43231257-01	DF2	.86462515-01

51 JOBURG 85 FT. 1

R	.23567047 06	LAT	.48847480 01	LON	.93264735 02				
MIN	.75203333 03	HA	.29313185 03	DEC	.56096992 01	ELE	.18042594 02	AZI	.74265808 02
CKC	.25915404 03	CKM	.10671500 01	CKT	.10671500 01	PSS	.99535672 02	PSM	.17244618 02
UT	.12533889 02	DHA	.41613201-02	DDE	.39727950-04	DEL	.35884750-02	DAZ	-.21746754-02
ET	.12524167 02	RGE	.23361785 06	DRG	.91524579 00	DDR	.49842422-05	SLS	.19946419 03
RDI	.63754784 04	PHI	-.25739277 02	THI	.27685332 02	SPS	.80377431 02	PGL	.35053753 03
DT	.77926515 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.52936965 05	F1	.81930965 05	F2	.10586193 06	XA	.29668302 08	PRA	.27170252 02
D1	.27310321 04	D2	.35287310 04	DOP	.31921228-01	DF1	.15961445-01	DF2	.31922891-01

HELIOCENTRIC EQUATORIAL COORDINATES

X	.91218542 08	Y	-.11144149 09	Z	-.48350244 08	DX	.24395591 02	DY	.17060638 02	DZ	.73055999 01
R	.15191370 09	LAT	-.18558599 02	LON	.30930146 03	V	.30652602 02	PTH	-.35880008 00	AZ	.75563227 02
XE	.91007280 08	YE	-.11154399 09	ZE	-.48370311 08	DXE	.23362880 02	DYE	.16269235 02	DZE	.70549224 01
XT	.91383208 08	YT	-.11147478 09	ZT	-.48377693 08	DXT	.23156672 02	DYT	.17185054 02	DZT	.74698803 01
LTE	-.18572298 02	LOE	.30921055 03	LTT	-.18552861 02	LOT	.30934373 03	RST	.15204578 09	VST	.29788532 02
EPS	.78923640 02	ESP	.87076018-01	SEP	.10098910 03	EPM	.14020587 03	EMP	.23236819 02	MEP	.16557304 02
MPS	.14086480 03	MSP	.40178123-01	SMP	.39094713 02	SEM	.11754461 03	EMS	.62327652 02	ESM	.12763062 00
RPM	.17022679 06	SPN	.77372843 02								
GCE	.10105284 03	GCT	.28187310 03	SIP	.14028081 03	CPT	.92804274 02	SIN	.92220288 02	D1	.30578444 00
KEP	.23567047 06	VEP	.13250098 01	CPE	.98037487 02	CPS	.76929407 02	D2	.23884350 00	D3	.38359498-02

0 DAYS 13 HRS. 32 MIN. 2.000 SEC. 2356665362002020000000000 J.D.= 2438606.50000000 JULY 30,1964 00 00 00.000
TFL 1 DAYS 7 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC EQUATORIAL COORDINATES

X	.21493979 06	Y	.10532795 06	Z	.20966047 05	DX	.10104883 01	DY	.78016529 00	DZ	.24838535 00
R	.24027622 06	DEC	.50058874 01	RA	.26106456 02	V	.13005536 01	PTH	.77075231 02	AZ	.61611932 02
R	.24027622 06	LAT	.50058874 01	LON	.78448568 02	VE	.17245676 02	PTE	.42151940 01	AZE	.27046074 03
XS	-.91091362 08	YS	.11148539 09	ZS	.48344905 08	DXS	-.23350579 02	DYS	-.16284468 02	DZS	-.70615166 01
XM	.37516893 06	YM	.72496936 05	ZM	-.58875720 04	DXM	-.21598358 00	DYM	.91391347 00	DZM	.41510845 00
XT	.37516893 06	YT	.72496936 05	ZT	-.58875720 04	DXT	-.21598358 00	DYT	.91391347 00	DZT	.41510845 00
RS	.15186790 09	VS	.29330845 02	RM	.38215467 06	VM	.10267433 01	RT	.38215467 06	VT	.10267433 01
GED	.50398263 01	ALT	.23389818 06	LOS	.18159333 03	RAS	.12925122 03	RAM	.10936927 02	LOM	.63279037 02
DUT	.35000000 02	DT	.19200000 04	DR	.12676036 01	SHA	.23603854 06	DES	.18562277 02	DEM	-.88274730 00

41 WOOMERA 1

R	.24027622 06	LAT	.50058874 01	LON	.78448568 02				
MIN	.81203333 03	HA	.59563884 02	DEC	.58575915 01	ELE	.22216242 02	AZI	.29210882 03
CKC	.26018339 03	CKM	.20663947 01	CKT	.20663947 01	PSS	.10153547 03	PSM	.16071110 02
UT	.13533889 02	DHA	.41589177-02	DDE	.20483573-04	DEL	-.33077742-02	DAZ	-.26843290-02
ET	.13524166 02	RGE	.23779428 06	DRG	.16051579 01	DDR	.78565346-05	SLS	.19961810 03
RDI	.63726015 04	PHI	-.31212263 02	THI	.13688755 03	SPS	.78376651 02	PGL	.23753911 03
DT	.79319622 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.55140327 05	F1	.84140327 05	F2	.11028065 06	XA	.29668370 08	PRA	.24981551 02
D1	.28046775 04	D2	.36760218 04	DOP	.50316624-01	DF1	.25159622-01	DF2	.50319244-01

51 JOBURG 85 FT. 1

R	.24027622 06	LAT	.50058874 01	LON	.78448568 02				
MIN	.81203333 03	HA	.30815574 03	DEC	.57485715 01	ELE	.30677510 02	AZI	.65462337 02
CKC	.25931028 03	CKM	.11932801 01	CKT	.11932801 01	PSS	.99512366 02	PSM	.16905245 02
UT	.13533889 02	DHA	.41845013-02	DDE	.37329283-04	DEL	.34077269-02	DAZ	-.27815907-02
ET	.13524166 02	RGE	.23696084 06	DRG	.94622863 00	DDR	.12065982-04	SLS	.19958760 03
RDI	.63754784 04	PHI	-.25739277 02	THI	.27685332 02	SPS	.80399487 02	PGL	.34539869 03
DT	.79041617 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.53030182 05	F1	.82030182 05	F2	.10606036 06	XA	.29668305 08	PRA	.27187481 02
D1	.27343394 04	D2	.35353455 04	DOP	.77275734-01	DF1	.38639880-01	DF2	.77279760-01

HELICCENTRIC — EQUATORIAL COORDINATES

X	.91306301 08	Y	-.11138006 09	Z	-.48323939 08	DX	.24361068 02	DY	.17064633 02	DZ	.73099020 01
R	.15191301 09	LAT	-.18548222 02	LON	.30934395 03	V	.30628385 02	PTH	-.36430692 00	AZ	.75545430 02
XE	.91091362 08	YE	-.11148539 09	ZE	-.48344905 08	DXE	.23350579 02	DYE	.16284468 02	DZE	.70615166 01
XT	.91466530 08	YT	-.11141290 09	ZT	-.48350792 08	DXT	.23134596 02	DYT	.17198381 02	DZT	.74766251 01
LTE	-.18562277 02	LOE	.30925123 03	LTT	-.18542591 02	LOT	.30938493 03	RST	.15204196 09	VST	.29780762 02
EPS	.79134250 02	ESP	.88745359-01	SEP	.10077672 03	EPM	.13980041 03	EMP	.23942651 02	MEP	.16256928 02
MPS	.14105919 03	MSP	.38308338-01	SMP	.38901549 02	SEM	.11703177 03	EMS	.62839944 02	ESM	.12820425 00
RPM	.16574791 06	SPN	.77613188 02								
GCE	.10102535 03	GCT	.28188299 03	SIP	.14045942 03	CPT	.92853124 02	SIN	.92253359 02	D1	.31404831 00
REP	.24027622 06	VEP	.13005536 01	CPE	.98067143 02	CPS	.76933515 02	D2	.24600435 00	D3	.40740735-02

0 DAYS 14 HRS. 32 MIN. 2.000 SEC. 2356665400042020000000000 J.D.= 2438606.54166666 JULY 30,1964 01 00 00.000
TFL 1 DAYS 8 HRS. 9 MIN. 52.127 SEC.

GECCENTRIC — EQUATORIAL COORDINATES

X	.21853894 06	Y	.10811681 06	Z	.21856146 05	DX	.98918905 00	DY	.76924806 00	DZ	.24611758 00
R	.24479829 06	DEC	.51223174 01	RA	.26322779 02	V	.12770323 01	PTH	.77099069 02	AZ	.61620188 02
R	.24479827 06	LAT	.51223183 01	LON	.63623824 02	VE	.17573496 02	PTE	.40618776 01	AZE	.27044296 03
XS	-.91175403 08	YS	.11142674 09	ZS	.48319471 08	DXS	-.23338266 02	DYS	-.16299695 02	DZS	-.70681081 01
XM	.37437379 06	YM	.75783470 05	ZM	-.43929654 04	DXM	-.22575272 00	DYM	.91192074 00	DZM	.41522058 00
XT	.37437379 06	YT	.75783470 05	ZT	-.43929654 04	DXT	-.22575272 00	DYT	.91192074 00	DZT	.41522058 00
RS	.15186719 09	VS	.29331091 02	RM	.38199237 06	VM	.10271182 01	RT	.38199237 06	VT	.10271182 01
GED	.51567381 01	ALT	.23842025 06	LOS	.16659293 03	RAS	.12929189 03	RAM	.11443595 02	LOM	.48744636 02
DUT	.35000000 02	DT	.19200000 04	DR	.12447969 01	SHA	.24064124 06	DES	.18552244 02	DEM	-.65892371 00

41 WOOMERA 1

R	.24479827 06	LAT	.51223183 01	LON	.63623824 02				
MIN	.87203333 03	HA	.74497973 02	DEC	.59277145 01	ELE	.10011508 02	AZI	.28327256 03
CKC	.26020255 03	CKM	.20946111 01	CKT	.20946111 01	PSS	.10145061 03	PSM	.15669554 02
UT	.14533889 02	DHA	.41376359-02	DDE	.18591196-04	DEL	-.34543802-02	DAZ	-.22717875-02
ET	.14524166 02	RGE	.24360997 06	DRG	.16218489 01	DDR	.13C5C716-05	SLS	.19982797 03
RDI	.63726015 04	PHI	-.31212263 02	THI	.13688755 03	SPS	.78459336 02	POL	.23351814 03
DT	.81259528 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.55193778 05	F1	.84193778 05	F2	.11038756 06	XA	.29668372 08	PRA	.25088530 02
D1	.28064593 04	D2	.36795852 04	DOP	.83582393-02	DF1	.41793374-02	DF2	.83586746-02

51 JOBURG 85 FT. 1

R	.24479827 06	LAT	.51223183 01	LON	.63623824 02				
MIN	.87203333 03	HA	.32325409 03	DEC	.58778404 01	ELE	.42339588 02	AZI	.53622460 02
CKC	.25944305 03	CKM	.13351069 01	CKT	.13351069 01	PSS	.99561922 02	PSM	.16523713 02
UT	.14533889 02	DHA	.42025163-02	DDE	.34407841-04	DEL	.30242883-02	DAZ	-.39048200-02
ET	.14524166 02	RGE	.24045888 06	DRG	.10006661 01	DDR	.17921294-04	SLS	.19971488 03
RDI	.63754784 04	PHI	-.25739277 02	THI	.27685332 02	SPS	.80348643 02	POL	.33678975 03
DT	.80208436 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.53204450 05	F1	.82204450 05	F2	.10640890 06	XA	.29668110 08	PRA	.27130187 02
D1	.27401483 04	D2	.35469633 04	DOP	.11477567 00	DF1	.57390823-01	DF2	.11478165 00

HELICCENTRIC — EQUATORIAL COORDINATES

X	.91393941 08	Y	-.11131862 09	Z	-.48297614 08	DX	.24327455 02	DY	.17068943 02	DZ	.73142257 01
R	.15191230 09	LAT	-.18537839 02	LON	.30938641 03	V	.30605094 02	PTH	-.36932625 00	AZ	.75527837 02
XE	.91175403 08	YE	-.11142674 09	ZE	-.48319471 08	DXE	.23338266 02	DYE	.16299695 02	DZE	.70681081 01
XT	.91546776 08	YT	-.11135096 09	ZT	-.48323863 08	DXT	.23112513 02	DYT	.17211616 02	DZT	.74833287 01
LTE	-.18552244 02	LOE	.30929189 03	LTT	-.18532372 02	LOT	.30942613 03	RST	.15203813 09	VST	.29772944 02
EPS	.79335158 02	ESP	.90923484-01	SEP	.10057408 03	EPM	.13941162 03	EMP	.24642012 02	MEP	.15946368 02
MPS	.14124664 03	MSP	.38308338-01	SMP	.38715301 02	SEM	.11651850 03	EMS	.63352684 02	ESM	.12877532 00
RPM	.16134395 06	SPN	.77842200 02								
GCE	.10099928 03	GCT	.28189205 03	SIP	.14063035 03	CPT	.92900404 02	SIN	.92284112 02	D1	.32270141 00
REP	.24479829 06	VEP	.12770323 01	CPE	.98095459 02	CPS	.76937623 02	D2	.25348281 00	D3	.43304037-02

0 DAYS 15 HRS. 32 MIN. 2.000 SEC. 2356665416102020000000000 J.D.= 2438606.58333334 JULY 30,1964 02 00 00.000
TFL 1 DAYS 9 HRS. 9 MIN. 52.127 SEC.

GECCENTRIC — EQUATORIAL COORDINATES

X	.22206298 06	Y	.11086691 06	Z	.22738125 05	DX	.96875118 00	DY	.75863042 00	DZ	.24387342 00
R	.24923977 06	DEC	.52343683 01	RA	.26531068 02	V	.12543816 01	PTH	.77120478 02	AZ	.61627198 02
R	.24923976 06	LAT	.52343683 01	LON	.48791045 02	VE	.17895364 02	PTE	.39181772 01	AZE	.27042640 03
XS	-.91259462 08	YS	.11136803 09	ZS	.48294012 08	DXS	-.23325942 02	DYS	-.16314916 02	DZS	-.70746968 01
XM	.37354351 06	YM	.79062676 05	ZM	-.28980232 04	DXM	-.23551376 00	DYM	.90984046 00	DZM	.41529413 00
XT	.37354351 06	YT	.79062676 05	ZT	-.28980232 04	DXT	-.23551376 00	DYT	.90984046 00	DZT	.41529413 00
RS	.15186648 09	VS	.29331338 02	RM	.38187988 06	VM	.10274948 01	RT	.38182988 06	VT	.10274948 01
GED	.52698392 01	ALT	.24286174 06	LOS	.15159253 03	RAS	.12933256 03	RAM	.11950615 02	LOM	.34210590 02
DUT	.35000000 02	DT	.19200000 04	DR	.12228225 01	SHA	.24516042 06	DES	.18542202 02	DEM	-.43486960 00

41 WOOMERA 1

R	.24923976 06	LAT	.52343683 01	LON	.48791045 02				
MIN	.93203333 03	HA	.89354672 02	DEC	.59923016 01	ELE	-.25515614 01	AZI	.27546186 03
CKC	.26018918 03	CKM	.20893975 01	CKT	.20893975 01	PSS	.10C129544 03	PSM	.15289122 02
UT	.15533889 02	DHA	.41161882-02	DDE	.17408444-04	DEL	-.35133989-02	DAZ	-.21032008-02
ET	.15524166 02	RGE	.24944214 06	DRG	.16140489 01	DDR	-.56675143-05	SLS	.20003347 03
RDI	.63726015 04	PHI	-.31212263 02	THI	.13688755 03	SPS	.78612294 02	POL	.23143209 03
DT	.83204929 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.55168800 05	F1	.84168799 05	F2	.11033760 06	XA	.29668371 08	PRA	.25272900 02
D1	.28056266 04	D2	.36779200 04	DOP	-.36297197-01	DF1	-.18149544-01	DF2	-.36299087-01

51 JOBURG 85 FT. 1

R	.24923976 06	LAT	.52343683 01	LON	.48791045 02				
MIN	.93203333 03	HA	.33840638 03	DEC	.59958285 01	ELE	.51963264 02	AZI	.36441932 02
CKC	.25958372 03	CKM	.14839393 01	CKT	.14839393 01	PSS	.99665561 02	PSM	.16107017 02
UT	.15533889 02	DHA	.42143237-02	DDE	.31087595-04	DEL	.22287510-02	DAZ	-.57609387-02
ET	.15524166 02	RGE	.24418737 06	DRG	.10732439 01	DDR	.22C99984-04	SLS	.19984853 03
RDI	.63754784 04	PHI	-.25739277 02	THI	.27685332 02	SPS	.80243643 02	POL	.32256281 03
DT	.81452127 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.53436936 05	F1	.82436936 05	F2	.10687387 06	XA	.29668317 08	PRA	.27018967 02
D1	.27478978 04	D2	.35624624 04	DOP	.14153779 00	DF1	.7C772581-01	DF2	.14154516 00

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.91481464 08	Y	-.11125716 09	Z	-.48271273 08	DX	.24294692 02	DY	.17073547 02	DZ	.73185702 01
R	.15191159 09	LAT	-.18527451 02	LON	.30942883 03	V	.30582667 02	PTH	-.37389224 00	AZ	.75510436 02
XE	.91259402 08	YE	-.11136803 09	ZE	-.48294012 08	DXE	.23325942 02	DYE	.16314916 02	DZE	.70746968 01
XT	.91632945 08	YT	-.11128897 09	ZT	-.48296910 08	DXT	.23090428 02	DYT	.17224757 02	DZT	.74899909 01
LTE	-.18542202 02	LOE	.30933256 03	LTT	-.18522145 02	LOT	.30946730 03	RST	.15203428 09	VST	.29765081 02
EPS	.79527031 02	ESP	.92523435-01	SEP	.10038050 03	EPM	.13903870 03	EMP	.25335005 02	MEP	.15626286 02
MPS	.14142727 03	MSP	.36342480-01	SMP	.38535863 02	SEM	.11600479 03	EMS	.63865875 02	ESM	.12877532 00
RPM	.15685191 06	SPN	.78060683 02								
GCE	.10097454 03	GCT	.28190020 03	SIP	.14079364 03	CPT	.92946183 02	SIN	.92312559 02	D1	.33177735 00
REP	.24923977 06	VEP	.12543816 01	CPE	.98122533 02	CPS	.76941731 02	D2	.26130674 00	D3	.46069036-02

0 DAYS 16 HRS. 32 MIN. 2.000 SEC. 23566654341420200000000 J.C.= 2438606.62500000 JULY 30,1964 03 00 00.000
TFL 1 DAYS 10 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.22551491 06	Y	.11357928 06	Z	.23612063 05	DX	.94911924 00	DY	.74829303 00	DZ	.24165192 00
R	.25360354 06	DEC	.53423306 01	RA	.26731845 02	V	.12325443 01	PTH	.77139881 02	AZ	.61632875 02
R	.25360354 06	LAT	.53423306 01	LON	.33950758 02	VE	.18211496 02	PTE	.37832281 01	AZE	.27041096 03
XS	-.91343351 08	YS	.11130927 09	ZS	.48268533 08	DXS	-.23313605 02	DYS	-.16330129 02	DZS	-.70812822 01
XM	.37267811 06	YM	.82334220 05	ZM	-.14028918 04	DXM	-.24526571 00	DYM	.90767264 00	DZM	.41532899 00
XT	.37267811 06	YT	.82334220 05	ZT	-.14028918 04	DXT	-.24526571 00	DYT	.90767264 00	DZT	.41532899 00
RS	.15186577 09	VS	.29331585 02	RM	.38166721 06	VM	.10278731 01	RT	.38166721 06	VT	.10278731 01
GED	.53785246 01	ALT	.24722552 06	LOS	.13659212 03	RAS	.12937321 03	RAM	.12458005 02	LOM	.19676918 02
OUT	.35000000 02	DT	.19200000 04	DR	.12016276 01	SHA	.24959910 06	DES	.18532154 02	DEM	-.21060290 00

51 JOBURG 85 FT. 1

R	.25360354 06	LAT	.53423306 01	LON	.33950758 02						
MIN	.99203333 03	HA	.35358907 03	DEC	.61014011 01	ELE	.57556123 02	AZI	.11944025 02		
CKC	.25972319 03	CKM	.16305655 01	CKT	.16305655 01	PSS	.99801620 02	PSM	.15663575 02		
UT	.16533889 02	DHA	.42193475-02	DDE	.27543051-04	DEL	.75952144-03	DAZ	-.76913530-02		
ET	.16524166 02	RGE	.24820009 06	DRG	.11573590 01	DDR	.24278792-04	SLS	.19999011 03		
RDI	.63754784 04	PHI	-.25739277 02	THI	.27685332 02	SPS	.80106131 02	POL	.30085732 03		
DT	.82790628 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09		
BF1	.53706305 05	F1	.82706305 05	F2	.10741261 06	XA	.29668326 08	PRA	.26877351 02		
D1	.27568768 04	D2	.35804203 04	DOP	.15549182 00	DF1	.77749958-01	DF2	.15549992 00		

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.91568865 08	Y	-.11119569 09	Z	-.48244921 08	DX	.24262725 02	DY	.17078422 02	DZ	.73229341 01
R	.15191086 09	LAT	-.18517061 02	LON	.30947121 03	V	.30561048 02	PTH	-.37803560 00	AZ	.75493214 02
XE	.91343351 08	YE	-.11130927 09	ZE	-.48268533 08	DXE	.23313605 02	DYE	.16330129 02	DZE	.70812822 01
XT	.91716029 08	YT	-.11122693 09	ZT	-.48269936 08	DXT	.23068340 02	DYT	.17237802 02	DZT	.74966112 01
LTE	-.18532154 02	LOE	.30937321 03	LTT	-.18511913 02	LOT	.30950847 03	RST	.15203042 09	VST	.29757172 02
EPS	.79710464 02	ESP	.94614623-01	SEP	.10019539 03	EPM	.13868099 03	EMP	.26021724 02	MEP	.15297282 02
MPS	.14160115 03	MSP	.34970568-01	SMP	.38363147 02	SEM	.11549064 03	EMS	.64379517 02	ESM	.12972151 00
RPM	.15250904 06	SPN	.78269353 02								
GCE	.10095101 03	GCT	.28190737 03	SIP	.14094931 03	CPT	.92990532 02	SIN	.92338699 02	D1	.34131332 00
REP	.25360354 06	VEP	.12325443 01	CPE	.98148446 02	CPS	.76945842 02	D2	.26950691 00	D3	.49058069-02

0 DAYS 17 HRS. 32 MIN. 2.000 SEC. 23566654522020200000000 J.C.= 2438606.66666666 JULY 30,1964 04 00 00.000

TFL 1 DAYS 11 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.22885754 06	Y	.11625493 06	Z	.24478047 05	DX	.93024357 00	DY	.73821821 00	DZ	.23945202 00
R	.25785236 06	DEC	.54464713 01	RA	.26925590 02	V	.12114687 01	PTH	.77157690 02	AZ	.61637121 02
R	.25785236 06	LAT	.54464713 01	LON	.19103434 02	VE	.18522100 02	PTE	.36562634 01	AZE	.27039650 03
XS	-.91427263 08	YS	.11125045 09	ZS	.48243028 08	DXS	-.23301257 02	DYS	-.16345337 02	DZS	-.70878651 01
XM	.37177761 06	YM	.85597818 05	ZM	.92301486 02	DXM	-.25500771 00	DYM	.90541719 00	DZM	.41532505 00
XT	.37177761 06	YT	.85597818 05	ZT	.92301486 02	DXT	-.25500771 00	DYT	.90541719 00	DZT	.41532505 00
RS	.15186506 09	VS	.29331833 02	RM	.38150436 06	VM	.10282529 01	RT	.38150436 06	VT	.10282529 01
GED	.54833624 01	ALT	.25151435 06	LOS	.12159171 03	RAS	.12941387 03	RAM	.12965785 02	LOM	.51436274 01
OUT	.35000000 02	DT	.19200000 04	DR	.11811645 01	SHA	.25396014 06	DES	.18522096 02	DEM	.13862189-01

51 JOBURG 85 FT. 1

R	.25785236 06	LAT	.54464713 01	LON	.19103434 02						
MIN	.10520333 04	HA	.87774796 01	DEC	.61941166 01	ELE	.56947964 02	AZI	.34384977 03		
CKC	.25985250 03	CKM	.17659872 01	CKT	.17659872 01	PSS	.99947192 02	PSM	.15202597 02		
UT	.17533888 02	DHA	.42175467-02	DDE	.23979656-04	DEL	-.10799433-02	DAZ	-.74285305-02		
ET	.17524166 02	RGE	.25252514 06	DRG	.12454536 01	DDR	.24299243-04	SLS	.20014016 03		
RDI	.63754784 04	PHI	-.25739277 02	THI	.27685332 02	SPS	.79958993 02	POL	.27549037 03		
DT	.84233308 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09		
BF1	.53988417 05	F1	.82988416 05	F2	.10797683 06	XA	.29668334 08	PRA	.26730008 02		
D1	.27662805 04	D2	.35992278 04	DOP	.15562279 00	DF1	.77815448-01	DF2	.15563090 00		

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.91656160 08	Y	-.11113420 09	Z	-.48218549 08	DX	.24231500 02	DY	.17083555 02	DZ	.73273171 01
R	.15191014 09	LAT	-.18506663 02	LON	.30951356 03	V	.30540187 02	PTH	-.38178196 00	AZ	.75476160 02
XE	.91427263 08	YE	-.11125045 09	ZE	-.48243028 08	DXE	.23301257 02	DYE	.16345337 02	DZE	.70878651 01
XT	.91795040 08	YT	-.11116485 09	ZT	-.48242935 08	DXT	.23046249 02	DYT	.17250754 02	DZT	.75031901 01
LTE	-.18522096 02	LOE	.30941387 03	LTT	-.18501670 02	LOT	.30954962 03	RST	.15202654 09	VST	.29749217 02
EPS	.79885994 02	ESP	.95387001-01	SEP	.10001822 03	EPM	.13833786 03	EMP	.26702249 02	MEP	.14959884 02
MPS	.14176838 03	MSP	.32805301-01	SMP	.38197063 02	SEM	.11497605 03	EMS	.64893614 02	ESM	.13028593 00
RPM	.14815274 06	SPN	.78468853 02								
GCE	.10092863 03	GCT	.28191347 03	SIP	.14109738 03	CPT	.93033517 02	SIN	.92362518 02	D1	.35135069 00
REP	.25785236 06	VEP	.12114687 01	CPE	.98173273 02	CPS	.76949954 02	D2	.27811759 00	D3	.52296698-02

0 DAYS 18 HRS. 32 MIN. 2.000 SEC. 23566654702420200000000 J.C.= 2438606.70833333 JULY 30,1964 05 00 00.000
TFL 1 DAYS 12 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.23221351 06	Y	.11889476 06	Z	.25336149 05	DX	.91208012 00	DY	.72838944 00	DZ	.23727249 00
R	.26210875 06	DEC	.55470288 01	RA	.27112727 02	V	.11911085 01	PTH	.77174328 02	AZ	.61639824 02
R	.26210875 06	LAT	.55470288 01	LON	.42495029 01	VE	.18827368 02	PTE	.35366087 01	AZE	.27038295 03
XS	-.91511127 08	YS	.11119158 09	ZS	.48217499 08	DXS	-.23288897 02	DYS	-.16360537 02	DZS	-.70944449 01
XM	.37084205 06	YM	.88853138 05	ZM	.15874106 04	DXM	-.26473878 00	DYM	.90307415 00	DZM	.41528220 00
XT	.37084205 06	YT	.88853138 05	ZT	.15874106 04	DXT	-.26473878 00	DYT	.90307415 00	DZT	.41528220 00
RS	.15186435 09	VS	.29332082 02	RM	.38134135 06	VM	.10286344 01	RT	.38134135 06	VT	.10286344 01
GED	.55845924 01	ALT	.25573075 06	LOS	.10659130 03	RAS	.12945452 03	RAM	.13473970 02	LOM	.35061074 03
OUT	.35000000 02	DT	.19200000 04	DR	.11613904 01	SHA	.25824619 06	DES	.18512028 02	DEM	.23850594 00

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51 JOBURG 85 FT.        1
     R .2621C875 06    LAT .55470288 01    LON .42495029 01
   MIN .1112C333 04     HA .23947793 02    DEC .62742885 01    ELE .5C429746 02    AZI .32070069 03
   CKC .25996371 03    CKM .18821418 01    CKT .18821418 01    PSS .1CCC7994 03    PSM .14733282 02
    UT .18533888 02    DHA .42094187-02    DDE .2060920?-04    DEL-.24184677-02    DAZ-.53601246-02
    ET .18524166 02    RGE .25716278 06    DRG .13297448 01    DDR .2218498?-04    SLS .20029823 03
   RDI .63754784 04    PHI-.25739277 02    THI .27685332 02    SPS .79824565 02    POL .25509280 03
    DT .8578C259 00    RFB .96004999 09    RF1 .96004999 09    RF2 .29668212 08     FA .96004999 09
   BF1 .54258350 05     F1 .83258349 05     F2 .10851670 06     XA .29668343 08    PRA .26600763 02
    D1 .27752783 04     D2 .36172233 04    DDP .14208216 00    DF1 .71C44780-01    DF2 .14208956 00

     HELICCENTRIC                                                                          EQUATORIAL COORDINATES

     X  .91743340 08     Y -.11107268 09     Z -.48192162 08    DX  .242CC977 02    DY  .17088926 02    DZ  .73317173 01
     R  .1519C940 09   LAT -.18496261 02   LON  .30955588 03     V  .30520039 02   PTH -.38515436 00    AZ  .75459264 02
    XE  .91511127 08     YE -.11119158 09     ZE -.48217499 08   DXE  .23288897 02   DYE  .16360537 02   DZE  .70944449 01
    XT  .91881969 08     YT -.11110272 09     ZT -.48215912 08   DXT  .23C24158 02   DYT  .17263611 02   DZT  .75097270 01
   LTE -.18512028 02    LOE  .30945452 03    LTT -.18491421 02    LOT  .30959075 03    RST  .15202265 09    VST  .29741219 02
   EPS  .80054105 02    ESP  .97917601-01    SEP  .99848489 02    EPM  .13800876 03    EMP  .27376646 02    MEP  .14614585 02
   MPS  .14192902 03    MSP  .32805301-01    SMP  .38037548 02    SEM  .11446101 03    EMS  .65408164 02    ESM  .13066085 00
   RPM  .14382063 06    SPN  .78659766 02
   GCE  .10096732 03    GCT  .28191842 03    SIP  .14123781 03    CPT  .93C75208 02    SIN  .92383996 02     D1  .36193547 00
   REP  .2621C875 06    VEP  .11911085 01    CPE  .98197083 02    CPS  .76954067 02     D2  .28717689 00     D3  .55814193-02

   0 DAYS 19 HRS. 32 MIN.  2.000 SEC.        2356665506302020000000000 J.D.= 2438606.75000000  JULY 30,1964 06 00 00.000
                                            TFE    1 DAYS 13 HRS.  9 MIN. 52.127 SEC.

     GEOCENTRIC                                                                            EQUATORIAL COORDINATES

     X  .23546533 06     Y  .12149962 06     Z  .26186434 05    DX  .89458367 00    DY  .71879143 00    DZ  .23511201 00
     R  .26625515 06   DEC  .56442164 01    RA  .27293638 02     V  .11714220 01   PTH  .77190204 02    AZ  .61640859 02
     R  .26625515 06   LAT  .56442164 01   LON  .34938934 03    VE  .19127484 02   PTE  .34236604 01   AZE  .27037020 03
    XS -.91594943 08     YS  .11113265 09     ZS  .48191949 08   DXS -.23276526 02   DYS -.16375730 02   DZS -.71010217 01
    XM  .36987150 06     YM  .92099851 05     ZM  .30822895 04   DXM -.27445793 00   DYM  .90064350 00   DZM  .41520038 00
    XT  .36987150 06     YT  .92099851 05     ZT  .30822895 04   DXT -.27445793 00   DYT  .90064350 00   DZT  .41520038 00
    RS  .15186363 09     VS  .29332332 02     RM  .38117818 06    VM  .1C290176 01    RT  .38117818 06    VT  .10290176 01
   GED  .56824296 01    ALT  .25987715 06    LOS  .91590877 02   RAS  .12949517 03   RAM  .13982573 02   LOM  .33607828 03
   DUT  .35000000 02     DT  .19200000 04     DR  .11422670 01   SHA  .26245975 06   DES  .18501952 02   DEM  .46331136 00

51 JOBURG 85 FT.        1
     R .26625515 06    LAT .56442164 01    LON .34938934 03
   MIN .1172C333 04     HA .39078853 02    DEC .63429677 01    ELE .4C315571 02    AZI .30474595 03
   CKC .26005C40 03    CKM .19725330 01    CKT .19725330 01    PSS .1CC17979 03    PSM .14264099 02
    UT .19533888 02    DHA .41959333-02    DDE .17624364-04    DEL-.31174196-02    DAZ-.36328378-02
    ET .19524166 02    RGE .26208585 06    DRG .14028563 01    DDR .18134750-04    SLS .20046294 03
   RDI .63754784 04    PHI-.25739277 02    THI .27685332 02    SPS .79722911 02    POL .24200912 03
    DT .87422416 00    RFB .96004999 09    RF1 .96004999 09    RF2 .29668212 08     FA .96004999 09
   BF1 .54492480 05     F1 .83492480 05     F2 .10898446 06     XA .29668350 08    PRA .26510770 02
    D1 .2783C826 04     D2 .36328321 04    DDP .11614273 00    DF1 .58C74389-01    DF2 .11614878 00

     HELICCENTRIC                                                                          EQUATORIAL COORDINATES

     X  .9183C408 08     Y -.11101115 09     Z -.4816576? 08    DX  .24171115 02    DY  .17094521 02    DZ  .73361336 01
     R  .1519C866 09   LAT -.18485855 02   LON  .30959816 03     V  .305CC563 02   PTH -.38816989 00    AZ  .75442520 02
    XE  .91594943 08     YE -.11113265 09     ZE -.48191949 08   DXE  .23276526 02   DYE  .16375730 02   DZE  .71010217 01
    XT  .91964814 08     YT -.11104055 09     ZT -.48188866 08   DXT  .23CC2068 02   DYT  .17276374 02   DZT  .75162220 01
   LTE -.18501952 02    LOE  .30949517 03    LTT -.18481165 02    LOT  .30963187 03    RST  .15201874 09    VST  .29733177 02
   EPS  .80215231 02    ESP  .98911715-01    SEP  .99685773 02    EPM  .13769322 03    EMP  .28044954 02    MEP  .14261817 02
   MPS  .14208313 03    MSP  .32051055-01    SMP  .37884555 02    SEM  .11394552 03    EMS  .65923172 02    ESM  .13122123 00
   RPM  .13951C46 06    SPN  .78842612 02
   GCE  .10088699 03    GCT  .28192211 03    SIP  .14137056 03    CPT  .93115671 02    SIN  .92403103 02     D1  .37311917 00
   REP  .26625515 06    VEP  .11714220 01    CPE  .98219935 02    CPS  .76958182 02     D2  .29677745 00     D3  .59644257-02

   0 DAYS 20 HRS. 32 MIN.  2.000 SEC.        2356665524342020000000C0 J.D.= 2438606.79166666  JULY 30,1964 07 00 00.000
                                            TFE    1 DAYS 14 HRS.  9 MIN. 52.127 SEC.

     GEOCENTRIC                                                                            EQUATORIAL COORDINATES

     X  .23865532 06     Y  .12407032 06     Z  .27028978 05    DX  .87773722 00    DY  .70940995 00    DZ  .23296916 00
     R  .27C33382 06   DEC  .57382330 01    RA  .27468676 02     V  .11523713 01   PTH  .77205761 02    AZ  .61640084 02
     R  .27033381 06   LAT  .57382330 01   LON  .33452332 03    VE  .19422622 02   PTE  .33168875 01   AZE  .27035819 03
    XS -.91678720 08     YS  .11107367 09     ZS  .48166372 08   DXS -.23264142 02   DYS -.16390917 02   DZS -.71075957 01
    XM  .36886597 06     YM  .95337670 05     ZM  .45768092 04   DXM -.28416429 00   DYM  .89812523 00   DZM  .41507945 00
    XT  .36886597 06     YT  .95337670 05     ZT  .45768092 04   DXT -.28416429 00   DYT  .89812523 00   DZT  .41507945 00
    RS  .15186292 09     VS  .29332582 02     RM  .38101486 06    VM  .10294023 01    RT  .38101486 06    VT  .10294023 01
   GED  .5777C742 01    ALT  .26395582 06    LOS  .76590452 02   RAS  .12953581 03   RAM  .14491617 02   LOM  .32154626 03
   DUT  .35000000 02     DT  .19200000 04     DR  .11237599 01   SHA  .26660321 06   DES  .18491867 02   DEM  .68826193 00

12 GOLDSTONE ECHO       1
     R .27033381 06    LAT .57382330 01    LON .33452332 03
   MIN .1232C333 04     HA .26756186 03    DEC .49611078 01    ELE .86409235 00    AZI .84541254 02
   CKC .25801339 03    CKM .35993784 03    CKT .35993784 03    PSS .98752419 02    PSM .14147141 02
    UT .20533888 02    DHA .41313945-02    DDE .35826387-04    DEL .33846931-02    DAZ .23424677-02
    ET .20524166 02    RGE .27016263 06    DRG .74783588 00    DDR-.6191C038-05    SLS .20072658 03
   RDI .63718803 04    PHI .35117429 02    THI .24319447 03    SPS .81146868 02    POL .54781526 02
    DT .90116541 00    RFB .96004999 09    RF1 .96004999 09    RF2 .29668212 08     FA .96004999 09
   BF1 .52394855 05     F1 .81394855 05     F2 .10478971 06     XA .29668285 08    PRA .28577966 02
    D1 .27131618 04     D2 .34929303 04    DDP-.39649848-01    DF1-.19825957-01    DF2-.39651913-01

51 JOBURG 85 FT.        1
     R .27033381 06    LAT .57382330 01    LON .33452332 03
   MIN .1232C333 04     HA .54153663 02    DEC .64018346 01    ELE .28411262 02    AZI .29367402 03
   CKC .2601CA22 03    CKM .20326805 01    CKT .20326805 01    PSS .1GC23038 03    PSM .13802140 02
    UT .20533888 02    DHA .41784126-02    DDE .15178765-04    DEL-.34555453-02    DAZ-.26178014-02
    ET .20524166 02    RGE .26724221 06    DRG .14584029 01    DDR .12494767-04    SLS .20063217 03
   RDI .63754784 04    PHI-.25739277 02    THI .27685332 02    SPS .79670418 02    POL .23404255 03
    DT .89142393 00    RFB .96004999 09    RF1 .96004999 09    RF2 .29668212 08     FA .96004999 09
   BF1 .54670362 05     F1 .83670362 05     F2 .10934072 06     XA .29668356 08    PRA .26477027 02
    D1 .2789C120 04     D2 .36446908 04    DDP .80021858-01    DF1 .4CC13013-01    DF2 .80026026-01
```

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.91917375 08	Y	-.11094960 09	Z	-.48139343 08	DX	.24141879 02	DY	.17100327 02	DZ	.73405648 01
R	.1519C791 09	LAT	-.18475443 02	LON	.30964041 03	V	.30481722 02	PTH	-.39084562 00	AZ	.75425916 02
XE	.91678720 08	YE	-.11107367 09	ZE	-.48166372 08	DXE	.23264142 02	DYE	.16390917 02	DZE	.71075957 01
XT	.92047585 08	YT	-.11097834 09	ZT	-.48161795 08	DXT	.22979478 02	DYT	.17289042 02	DZT	.75226751 01
LTE	-.18491867 02	LOE	.30953581 03	LTT	-.18470901 02	LOT	.30967297 03	RST	.15201482 09	VST	.29725090 02
EPS	.80369770 02	ESP	.10087055 00	SEP	.99529672 02	EPM	.13739079 03	EMP	.28707225 02	MEP	.13901977 02
MPS	.14223073 03	MSP	.32805301-01	SMP	.37738045 02	SEM	.11342959 03	EMS	.66438639 02	ESM	.13177923 00
RPM	.13522011 06	SPN	.79017863 02								
GCE	.10086760 03	GCT	.28192445 03	SIP	.14149556 03	CPT	.93154974 02	SIN	.92419796 02	D1	.38495963 00
REP	.27033382 06	VEP	.11523713 01	CPE	.98241882 02	CPS	.76962300 02	D2	.30681717 00	D3	.63825871-02

0 DAYS 21 HRS. 32 MIN. 2.000 SEC. 2356665542402020CC000000 J.C.= 2438606.83333333 JULY 30,1964 08 00 00.000
TFL 1 DAYS 15 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.24178576 06	Y	.12660761 06	Z	.27863834 05	DX	.86149199 00	DY	.70023153 00	DZ	.23084238 00
R	.27434693 06	DEC	.58292530 01	RA	.27638150 02	V	.11339227 01	PTH	.77221471 02	AZ	.61637331 02
R	.27434692 06	LAT	.58292530 01	LON	.31965173 03	VE	.19712947 02	PTE	.32158118 01	AZE	.27034684 03
XS	-.91762447 08	YS	.11101464 09	ZS	.48140775 08	DXS	-.23251747 02	DYS	-.16406097 02	DZS	-.71141664 01
XM	.36782554 06	YM	.98566253 05	ZM	.60708174 04	DXM	-.29385683 00	DYM	.89551939 00	DZM	.41491937 00
XT	.36782554 06	YT	.98566253 05	ZT	.60708174 04	DXT	-.29385683 00	DYT	.89551939 00	DZT	.41491937 00
RS	.15186221 09	VS	.29332833 02	RM	.38085139 06	VM	.10297887 01	RT	.38085139 06	VT	.10297887 01
GEO	.58687018 01	ALT	.26796894 06	LOS	.61590025 02	RAS	.12957644 03	RAM	.15001117 02	LUM	.30701469 03
OUT	.35C0CCC0 02	DT	.19200000 04	DR	.11058381 01	SHA	.27067879 06	DES	.18481774 02	DEM	.91333972 00

12 GOLDSTONE ECHO 1

R	.27434692 06	LAT	.58292530 01	LON	.31965173 03				
MIN	.1292C333 04	HA	.28247434 03	DEC	.50884738 01	ELE	.13121082 02	AZI	.93014582 02
CKC	.25808110 03	CKM	.64092787-02	CKT	.64092787-02	PSS	.98629136 02	PSM	.13812062 02
UT	.21533889 02	DHA	.41531370-02	CDE	.34860376-04	DEL	.34124C93-02	DAZ	.24013987-02
ET	.21524166 02	RGE	.27283025 06	DRG	.73848275 00	DDR	.98519561-06	SLS	.20081192 03
RDI	.63718803 04	PHI	.35117429 02	THI	.24319447 03	SPS	.81269121 02	PUL	.54503457 02
DT	.91CC6364 00	RFR	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.52364903 05	F1	.81364903 05	F2	.10472981 06	XA	.29668284 08	PRA	.28706544 02
D1	.27121634 04	D2	.34909935 04	DOP	.63C96160-02	DF1	.31549723-02	DF2	.63099445-02

51 JOBURG 85 FT. 1

R	.27434692 06	LAT	.58292530 01	LON	.31965173 03				
MIN	.1292C333 04	HA	.69160412 02	DEC	.64530268 01	ELE	.15641469 02	AZI	.28534025 03
CKC	.26013505 03	CKM	.20603551 01	CKT	.20603551 01	PSS	.10CC2002 03	PSM	.13352770 02
UT	.21533889 02	DHA	.41583848-02	CDE	.13374536-04	DEL	-.36188257-02	DAZ	-.20711991-02
ET	.21524166 02	RGE	.27255928 06	DRG	.149145C6 01	DDR	.57169289-05	SLS	.20080329 03
RDI	.63754784 04	PHI	-.25739277 02	THI	.27685332 02	SPS	.79678805 02	PUL	.22920310 03
DT	.90915977 00	RFR	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.54776193 05	F1	.83776193 05	F2	.10955239 06	XA	.29668359 08	PRA	.26511343 02
D1	.27925397 04	D2	.36517462 04	DOP	.36613669-01	DF1	.18307788-01	DF2	.36615576-01

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.92004232 08	Y	-.11088803 09	Z	-.48112911 08	DX	.24113239 02	DY	.17106328 02	DZ	.73450088 01
R	.1519C716 09	LAT	-.18465026 02	LON	.30968263 03	V	.30463485 02	PTH	-.39319179 00	AZ	.75409449 02
XE	.91762447 08	YE	-.11101464 09	ZE	-.48140775 08	DXE	.23251747 02	DYE	.16406097 02	DZE	.71141664 01
XT	.9213C272 08	YT	-.11091607 09	ZT	-.48134704 08	DXT	.22957890 02	DYT	.17301616 02	DZT	.75290857 01
LTE	-.18481774 02	LOE	.30957644 03	LTT	-.18460632 02	LOT	.30971406 03	RST	.15201089 09	VST	.29716961 02
EPS	.80518074 02	ESP	.10231507 00	SEP	.99379830 02	EPM	.13710111 03	EMP	.29363463 02	MEP	.13535418 02
MPS	.14237186 03	MSP	.30486634-01	SMP	.37598001 02	SEM	.11291321 03	EMS	.66954564 02	ESM	.13233487 00
RPM	.13C94762 06	SPN	.79185946 02								
GCE	.10084908 03	GCT	.28192529 03	SIP	.14161269 03	CPT	.93193191 02	SIN	.92434023 02	D1	.39752208 00
REP	.27434693 06	VEP	.11339227 01	CPE	.98262972 02	CPS	.76966418 02	D2	.31750004 00	D3	.68404301-02

0 DAYS 22 HRS. 32 MIN. 2.000 SEC. 235666556C4420200CC0CCCC J.C.= 2438606.87500000 JULY 30,1964 09 00 00.000
TFL 1 DAYS 16 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.24485876 06	Y	.12911222 06	Z	.28691062 05	DX	.84582683 00	DY	.69124364 00	DZ	.22873004 00
R	.27825652 06	DEC	.59174401 01	RA	.27802349 02	V	.1116C458 01	PTH	.77237809 02	AZ	.61632410 02
R	.27825652 06	LAT	.59174401 01	LON	.30477486 03	VE	.19998619 02	PTE	.31200056 01	AZE	.27033610 03
XS	-.91846132 08	YS	.11095555 09	ZS	.48115151 08	DXS	-.23239340 02	DYS	-.16421270 02	DZS	-.71207345 01
XM	.36675023 06	YM	.10178531 06	ZM	.75641830 04	DXM	-.30353466 00	DYM	.89282598 00	DZM	.41472001 00
XT	.36675023 06	YT	.10178531 06	ZT	.75641830 04	DXT	-.30353466 00	DYT	.89282598 00	DZT	.41472001 00
RS	.15186149 09	VS	.29333085 02	RM	.38068779 06	VM	.10301768 01	RT	.38068779 06	VT	.10301768 01
GEO	.59574771 01	ALT	.27191854 06	LOS	.46589593 02	RAS	.12961708 03	RAM	.15511090 02	LUM	.29248360 03
OUT	.35C0CCC0 02	DT	.19200000 04	DR	.10884743 01	SHA	.27468864 06	DES	.18471672 02	DEM	.11385276 01

12 GOLDSTONE ECHO 1

R	.27825652 06	LAT	.59174401 01	LON	.30477486 03				
MIN	.1352C333 04	HA	.29746232 03	DEC	.52115700 01	ELE	.25335281 02	AZI	.10212811 03
CKC	.25817027 03	CKM	.94811561-01	CKT	.94811561-01	PSS	.98578136 02	PSM	.13447083 02
UT	.22533889 02	DHA	.41731156-02	CDE	.33451833-04	DEL	.33572458-02	DAZ	.27104257-02
ET	.22524166 02	RGE	.27551030 06	DRG	.75456366 00	DDR	.78565013-05	SLS	.20089683 03
RDI	.63718803 04	PHI	.35117429 02	THI	.24319447 03	SPS	.81319108 02	PUL	.56180400 02
DT	.9190C331 00	RFR	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.52416400 05	F1	.81416400 05	F2	.10483280 06	XA	.29668286 08	PRA	.28759631 02
D1	.27138800 04	D2	.34944266 04	DOP	.50316410-01	DF1	.25159515-01	DF2	.50319031-01

51 JOBURG 85 FT. 1

R	.27825652 06	LAT	.59174401 01	LON	.30477486 03				
MIN	.1352C333 04	HA	.84092925 02	DEC	.64989582 01	ELE	.24618793 01	AZI	.27842396 03
CKC	.26013105 03	CKM	.20555859 01	CKT	.20555859 01	PSS	.1CC14216 03	PSM	.12919419 02
UT	.22533889 02	DHA	.41374340-02	CDE	.12258783-04	DEL	-.36921299-02	DAZ	-.18092611-02
ET	.22524166 02	RGE	.27794975 06	DRG	.14988110 01	DDR	-.16886557-05	SLS	.20097339 03
RDI	.63754784 04	PHI	-.25739277 02	THI	.27685332 02	SPS	.79754619 02	PUL	.22639858 03
DT	.92714046 00	RFR	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.54799765 05	F1	.83799765 05	F2	.10959953 06	XA	.29668359 08	PRA	.26619843 02
D1	.27933254 04	D2	.36533176 04	DOP	-.10814877-01	DF1	-.54C772CC-02	DF2	-.10815440-01

HELICENTRIC — EQUATORIAL COORDINATES

X	.92090990 08	Y	-.11082644 09	Z	-.48086460 08	DX	.24085167 02	DY	.17112514 02	DZ	.73494645 01
R	.15190641 09	LAT	-.18454602 02	LON	.30972482 03	V	.30445820 02	PTH	-.39521950 00	AZ	.75393110 02
XE	.91846132 08	YE	-.11095555 09	ZE	-.48115151 08	DXE	.23239340 02	DYE	.16421270 02	DZE	.71207345 01
XT	.92212882 08	YT	-.11085376 09	ZT	-.48107586 08	DXT	.22935805 02	DYT	.17314096 02	DZT	.75354545 01
LTE	-.18471672 02	LOE	.30961708 03	LTT	-.18450352 02	LOT	.30975512 03	RST	.15200695 09	VST	.29708789 02
EPS	.80660468 02	ESP	.10397499 00	SEP	.99235922 02	EPM	.13682386 03	EMP	.30013672 02	MEP	.13162463 02
MPS	.14250651 03	MSP	.30486634-01	SMP	.37464422 02	SEM	.11239638 03	EMS	.67470951 02	ESM	.13251956 00
RPM	.12665110 06	SPN	.79347248 02								
GCE	.10083139 03	GCT	.28192452 03	SIP	.14172183 03	CPT	.93230389 02	SIN	.92445713 02	D1	.41088035 00
REP	.27829652 06	VEP	.11160458 01	CPE	.98283249 02	CPS	.76970541 02	C2	.32883720 00	D3	.73432360-02

0 DAYS 23 HRS. 32 MIN. 2.000 SEC. 2356665576502020000000 J.D.= 2438606.91666666 JULY 30,1964 10 00 00.000
TEL 1 DAYS 17 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.24787638 06	Y	.13158480 06	Z	.29510711 05	DX	.83071813 00	DY	.68243427 00	DZ	.22663032 00
R	.28218458 06	DEC	.60029387 01	RA	.27961527 02	V	.10987131 01	PTH	.77255326 02	AZ	.61625098 02
R	.28218457 06	LAT	.60029387 01	LON	.28989298 03	VE	.20279788 02	PTE	.30290881 01	AZE	.27032590 03
XS	-.91929776 08	YS	.11089640 09	ZS	.48089503 08	DXS	-.23226921 02	DYS	-.16436437 02	DZS	-.71272998 01
XM	.36564010 06	YM	.10499451 06	ZM	.90567610 04	DXM	-.31319682 00	DYM	.89004503 00	DZM	.41448132 00
XT	.36564010 06	YT	.10499451 06	ZT	.90567610 04	DXT	-.31319682 00	DYT	.89004503 00	DZT	.41448132 00
RS	.15186078 09	VS	.29333338 02	RM	.38052405 06	VM	.10305664 01	RT	.38052405 06	VT	.10305664 01
GED	.60435458 01	ALT	.27580661 06	LOS	.31589156 02	RAS	.12965771 03	RAM	.16021556 02	LUM	.27795300 03
OUT	.35000000 02	DT	.19200000 04	DR	.10716439 01	SHA	.27863477 06	DES	.18461559 02	DEM	.13638112 01

12 GOLDSTONE ECHO 1

R	.28218457 06	LAT	.60029387 01	LON	.28989298 03				
MIN	.14120333 04	HA	.31251714 03	DEC	.53288093 01	ELE	.37144806 02	AZI	.11297344 03
CKC	.25827647 03	CKM	.19846865 00	CKT	.19846865 00	PSS	.98591758 02	PSM	.13053734 02
UT	.23533889 02	DHA	.41900744-02	DDE	.31612553-04	DEL	.31762150-02	DAZ	.33937157-02
ET	.23524166 02	RGE	.27829132 06	DRG	.79409507 00	DDR	.13933598-04	SLS	.20098406 03
KDI	.63718803 04	PHI	.35117429 02	THI	.24319447 03	SPS	.81304452 02	POL	.60471039 02
DT	.92827579 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.52542995 05	F1	.81542995 05	F2	.10508559 06	XA	.29668296 08	PRA	.28745877 02
D1	.27180998 04	D2	.35028663 04	DOP	.89236746-01	DF1	.44620697-01	DF2	.89241394-01

HELICCENTRIC — EQUATORIAL COORDINATES

X	.92177652 08	Y	-.11076482 09	Z	-.48059992 08	DX	.24057639 02	DY	.17118871 02	DZ	.73539301 01
R	.15190565 09	LAT	-.18444175 02	LON	.30976697 03	V	.30428704 02	PTH	-.39693046 00	AZ	.75376893 02
XE	.91929776 08	YE	-.11089640 09	ZE	-.48089503 08	DXE	.23226921 02	DYE	.16436437 02	DZE	.71272998 01
XT	.92295416 08	YT	-.11079141 09	ZT	-.48080446 08	DXT	.22913724 02	DYT	.17326682 02	DZT	.75417811 01
LTE	-.18461559 02	LOE	.30965771 03	LTT	-.18440066 02	LOT	.30979618 03	RST	.15200299 09	VST	.29700575 02
EPS	.80797241 02	ESP	.10491172 00	SEP	.99097662 02	EPM	.13655877 03	EMP	.30057828 02	MEP	.12783397 02
MPS	.14263666 03	MSP	.27976454-01	SMP	.37337327 02	SEM	.11187910 03	EMS	.67987797 02	ESM	.13325579 00
RPM	.12244877 06	SPN	.79502118 02								
GCE	.10081446 03	GCT	.28192199 03	SIP	.14182279 03	CPT	.93266649 02	SIN	.92454787 02	D1	.42511840 00
REP	.28218458 06	VEP	.10987131 01	CPE	.98302751 02	CPS	.76974665 02	C2	.34089816 00	D3	.78971995-02

1 DAYS 0 HRS. 32 MIN. 2.000 SEC. 2356665614542020000000CC0 J.D.= 2438606.95833333 JULY 30,1964 11 00 00.000

TEL 1 DAYS 18 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.25084057 06	Y	.13402594 06	Z	.30322815 05	DX	.81614574 00	DY	.67379194 00	DZ	.22454129 00
R	.28601297 06	DEC	.60858811 01	RA	.28115912 02	V	.10819003 01	PTH	.77274562 02	AZ	.61615136 02
R	.28601296 06	LAT	.60858811 01	LON	.27500629 03	VE	.20556602 02	PTE	.29427169 01	AZE	.27031619 03
XS	-.92013369 08	YS	.11083720 09	ZS	.48063835 08	DXS	-.23214491 02	DYS	-.16451596 02	DZS	-.71338619 01
XM	.36449523 06	YM	.10819353 06	ZM	.10548403 05	DXM	-.32284227 00	DYM	.88717661 00	DZM	.41420321 00
XT	.36449523 06	YT	.10819353 06	ZT	.10548403 05	DXT	-.32284227 00	DYT	.88717661 00	DZT	.41420321 00
RS	.15186006 09	VS	.29333591 02	RM	.38036019 06	VM	.10309577 01	RT	.38036019 06	VT	.10309577 01
GED	.61270407 01	ALT	.27963500 06	LOS	.16588714 02	RAS	.12969833 03	RAM	.16532526 02	LUM	.26342791 03
OUT	.35000000 02	DT	.19200000 04	DR	.10553255 01	SHA	.28251912 06	DES	.18451440 02	DEM	.15891673 01

12 GOLDSTONE ECHO 1

R	.28601296 06	LAT	.60858811 01	LON	.27500629 03				
MIN	.14720333 04	HA	.32762593 03	DEC	.54387284 01	ELE	.47923471 02	AZI	.12730431 03
CKC	.25839397 03	CKM	.31149590 00	CKT	.31149590 00	PSS	.98658345 02	PSM	.12634966 02
UT	.24533889 02	DHA	.42029408-02	DDE	.29397572-04	DEL	.27568503-02	DAZ	.46968780-02
ET	.24524166 02	RGE	.28125156 06	DRG	.85338788 00	DDR	.18765537-04	SLS	.20107597 03
KDI	.63718803 04	PHI	.35117429 02	THI	.24319447 03	SPS	.81236778 02	POL	.68825132 02
DT	.93815408 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.52732873 05	F1	.81732873 05	F2	.10546575 06	XA	.29668296 08	PRA	.28678151 02
D1	.27244291 04	D2	.35155249 04	DOP	.12018256 00	DF1	.60094409-01	DF2	.12018882 00

HELICCENTRIC — EQUATORIAL COORDINATES

X	.92264209 08	Y	-.11070318 09	Z	-.48033512 08	DX	.24030637 02	DY	.17125387 02	DZ	.73584031 01
R	.15190489 09	LAT	-.18433742 02	LON	.30980910 03	V	.30412111 02	PTH	-.39833150 00	AZ	.75360794 02
XE	.92013369 08	YE	-.11083720 09	ZE	-.48063835 08	DXE	.23214491 02	DYE	.16451596 02	DZE	.71338619 01
XT	.92377864 08	YT	-.11072901 09	ZT	-.48053287 08	DXT	.22891649 02	DYT	.17338772 02	DZT	.75480650 01
LTE	-.18451440 02	LOE	.30969833 03	LTT	-.18429773 02	LOT	.30983722 03	RST	.15199902 09	VST	.29692321 02
EPS	.80928657 02	ESP	.10721774 00	SEP	.98964780 02	EPM	.13630562 03	EMP	.31295883 02	MEP	.12398493 02
MPS	.14275626 03	MSP	.27976454-01	SMP	.37216768 02	SEM	.11136136 03	EMS	.68505109 02	ESM	.13380530 00
RPM	.11821895 06	SPN	.79650874 02								
GCE	.10075827 03	GCT	.28191752 03	SIP	.14191535 03	CPT	.93302046 02	SIN	.92461134 02	D1	.44033717 00
REP	.28601297 06	VEP	.10819003 01	CPE	.98321510 02	CPS	.76978791 02	C2	.35376226 00	D3	.85096215-02

1 DAYS 1 HRS. 32 MIN. 2.000 SEC. 2356665632602020000000CC0 J.D.= 2438607.00000000 JULY 30,1964 12 00 00.000
TEL 1 DAYS 19 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.25375324 06	Y	.13643628 06	Z	.31127419 05	DX	.80209760 00	DY	.66530570 00	DZ	.22246085 00
R	.28978357 06	DEC	.61663886 01	RA	.28265720 02	V	.10655858 01	PTH	.77296234 02	AZ	.61602210 02
R	.28978351 06	LAT	.61663886 01	LON	.26011503 03	VE	.20829201 02	PTE	.28605865 01	AZE	.27030694 03
XS	-.92096923 08	YS	.11077795 09	ZS	.48038140 08	DXS	-.23202048 02	DYS	-.16466749 02	DZS	-.71404214 01
XM	.36331566 06	YM	.11138208 06	ZM	.12038979 05	DXM	-.33247014 00	DYM	.88422073 00	DZM	.41388560 00
XT	.36331566 06	YT	.11138208 06	ZT	.12038979 05	DXT	-.33247014 00	DYT	.88422073 00	DZT	.41388560 00
RS	.15185934 09	VS	.29333846 02	RM	.38019623 06	VM	.10313505 01	RT	.38019623 06	VT	.10313505 01
GED	.62080842 01	ALT	.28340555 06	LOS	.15882702 01	RAS	.12973895 03	RAM	.17044025 02	LUM	.24889334 03
OUT	.35000000 02	DT	.19200000 04	DR	.10395004 01	SHA	.28634357 06	DES	.18441311 02	DEM	.18145823 01

```
12 GOLDSTONE ECHO        1
    R .28978351 06    LAT .61663886 01    LON .260115C3 03
  MIN .1532C333 04     HA .34277245 03    DEC .55401354 01    ELE .56425184 02    AZI .14778898 03
  CKC .25851618 03    CKM .42711307 00    CKT .42711367 00    PSS .98763004 02    PSM .12194952 02
   UT .25533888 02    DHA .42109302-02    DDE .26902948-04    DEL .18602018-02    DAZ .67916073-02
   ET .25524166 02    RGE .28445325 06    DRG .92726704 00    DDR .21984960-04    SLS .20117429 03
  RDI .63718803 04    PHI .35117429 02    THI .24319447 03    SPS .81130955 02    POL .83683437 02
   DT .94883380 00    RFB .96004999 09    RF1 .96004999 09    RF2 .29668212 08     FA .96004999 09
  BF1 .52965462 05     F1 .81969462 05     F2 .10593892 06     XA .29668303 08    PRA .28572704 02
   D1 .27323154 04     D2 .35312975 04    DOP .14080113 00    DF1 .7C4C4231-01    DF2 .14080846 00

     HELICCENTRIC                                                                    EQUATORIAL COORDINATES

   X  .92350676 08     Y -.11064151 09     Z -.48007012 08    DX  .24004141 02    DY  .17132055 02    DZ  .73628822 01
   R  .15190413 09   LAT -.18423303 02   LON  .30985121 03     V  .30396021 02   PTH -.39942007 00    AZ  .75344806 02
  XE  .92C96923 08     YE -.11077795 09     ZE -.48038140 08   DXE  .23202048 02   DYE  .16466749 02   DZE  .71404214 01
  XT  .9246C238 08     YT -.11066656 09     ZT -.480261C1 08   DXT  .22869578 02   DYT  .17350970 02   DZT  .75543070 01
 LTE -.18441311 02    LOE  .30973896 03    LTT -.18419471 02   LOT  .30987824 03   RST  .15199503 09   VST  .29684024 02
 EPS  .81054952 02    ESP  .10744563 00    SEP  .98837040 02   EPM  .13606424 03   EMP  .31927769 02   MEP  .12007988 02
 MPS  .14287125 03    MSP  .25217635-01    SMP  .37102808 02   SEM  .11084317 03   EMS  .69022884 02   ESM  .13398797 00
 RPM  .11400002 06    SPN  .79793797 02
 GCE  .10078277 03    GCT  .28191092 03    SIP  .14199921 03   CPT  .93336669 02   SIN  .92464635 02    D1  .45663177 00
 REP  .28978352 06    VEP  .10655858 01    CPE  .98339558 02   CPS  .76982919 02    D2  .36752069 00    D3  .91891651-02

  1 DAYS  2 HRS. 32 MIN.  2.000 SEC.        2356665656420202000000C0 J.D.= 2438607.04166666  JULY 30,1964 13 00 00.000
                                                TFL    1 DAYS 20 HRS.  9 MIN. 52.127 SEC.

     GECCENTRIC                                                                      EQUATORIAL COORDINATES

   X  .25661624 06     Y  .13881634 06     Z  .31924547 05    DX  .78854509 00    DY  .65696486 00    DZ  .22038668 00
   R  .29349795 06   DEC  .62445695 01    RA  .28411132 02     V  .10497507 01   PTH  .77320994 02    AZ  .61585970 02
   R  .29349794 06   LAT  .62445695 01   LON  .24521938 03    VE  .21097726 02   PTE  .27824158 01   AZE  .27029810 03
  XS -.92180430 08     YS  .11071864 09     ZS  .48012421 08   DXS -.23189594 02   DYS -.16481895 02   DZS -.71469779 01
  XM  .36210145 06     YM  .11455983 06     ZM  .13528341 05   DXM -.34207943 00   DYM  .88117746 00   DZM  .41352842 00
  XT  .36210145 06     YT  .11455983 06     ZT  .13528341 05   DXT -.34207943 00   DYT  .88117746 00   DZT  .41352842 00
  RS  .15185862 09     VS  .29334100 02     RM  .38003215 06    VM  .10317450 01    RT  .38003215 06    VT  .10317450 01
 GED  .62867853 01    ALT  .28712000 06    LOS  .34658782 03   RAS  .12977957 03   RAM  .17556067 02   LOM  .23436431 03
 DUT  .35000000 02     DT  .19200000 04     DR  .10241525 01   SHA  .29010989 06   DES  .18431173 02   DEM  .20400392 01


12 GOLDSTONE ECHO        1
    R .29349794 06    LAT .62445695 01    LON .24521938 03
  MIN .1592C333 04     HA .35793826 03    DEC .56322490 01    ELE .60453531 02    AZI .17583638 03
  CKC .25863617 03    CKM .53815444 00    CKT .53815444 00    PSS .98888689 02    PSM .11738746 02
   UT .26533888 02    DHA .42136287-02    DDE .24257516-04    DEL .27445132-03    DAZ .84851266-02
   ET .26524166 02    RGE .28793786 06    DRG .10094443 01    DDR .23346759-04    SLS .20128004 03
  RDI .63718803 04    PHI .35117429 02    THI .24319447 03    SPS .81004005 02    POL .10627055 03
   DT .96045721 00    RFB .96004999 09    RF1 .96004999 09    RF2 .29668212 08     FA .96004999 09
  BF1 .53232625 05     F1 .82232624 05     F2 .10646525 06     XA .29668311 08    PRA .28447956 02
   D1 .27410875 04     D2 .35488417 04    DOP .14952268 00    DF1 .74765233-01    DF2 .14953046 00

     HELICCENTRIC                                                                    EQUATORIAL COORDINATES

   X  .92437046 08     Y -.11057982 09     Z -.47980496 08    DX  .23978139 02    DY  .17138860 02    DZ  .73673645 01
   R  .1519C336 09   LAT -.18412857 02   LON  .30989328 03     V  .30380416 02   PTH -.40019700 00    AZ  .75328931 02
  XE  .9218C430 08     YE -.11071864 09     ZE -.48012421 08   DXE  .23189594 02   DYE  .16481895 02   DZE  .71469779 01
  XT  .92542531 08     YT -.11060408 09     ZT -.47998893 08   DXT  .22847514 02   DYT  .17363073 02   DZT  .75605062 01
 LTE -.18431173 02    LOE  .30977957 03    LTT -.18409163 02   LOT  .30991925 03   RST  .15199104 09   VST  .29675688 02
 EPS  .81176344 02    ESP  .10992114 00    SEP  .98714229 02   EPM  .13583454 03   EMP  .32553380 02   MEP  .11612079 02
 MPS  .14297953 03    MSP  .27088086-01    SMP  .36995549 02   SEM  .11C32453 03   EMS  .69541128 02   ESM  .13453449 00
 RPM  .10979039 06    SPN  .79931152 02
 GCE  .10076792 03    GCT  .28190197 03    SIP  .14207405 03   CPT  .93370608 02   SIN  .92465133 02    D1  .47414443 00
 REP  .29349795 06    VEP  .10497507 01    CPE  .98356920 02   CPS  .76987052 02    D2  .38227870 00    D3  .99461688-02

  1 DAYS  3 HRS. 32 MIN.  2.000 SEC.        2356665666702020000000C0 J.D.= 2438607.08333333  JULY 30,1964 14 00 00.000
                                                TFL    1 DAYS 21 HRS.  9 MIN. 52.127 SEC.

     GECCENTRIC                                                                      EQUATORIAL COORDINATES

   X  .25943136 06     Y  .14116660 06     Z  .32714212 05    DX  .77549292 00    DY  .64875890 00    DZ  .21831624 00
   R  .29715797 06   DEC  .63205221 01    RA  .28552313 02     V  .10343787 01   PTH  .77349672 02    AZ  .61565977 02
   R  .29715796 06   LAT  .63205221 01   LON  .23031949 03    VE  .21362312 02   PTE  .27079634 01   AZE  .27028961 03
  XS -.92263888 08     YS  .11065928 09     ZS  .47986681 08   DXS -.23177129 02   DYS -.16497034 02   DZS -.71535312 01
  XM  .36085270 06     YM  .11772646 06     ZM  .15016340 05   DXM -.35166913 00   DYM  .87804689 00   DZM  .41313162 00
  XT  .36085270 06     YT  .11772646 06     ZT  .15016340 05   DXT -.35166913 00   DYT  .87804689 00   DZT  .41313162 00
  RS  .15185790 09     VS  .29334356 02     RM  .37986798 06    VM  .10321411 01    RT  .37986798 06    VT  .10321411 01
 GED  .63632429 01    ALT  .29078002 06    LOS  .33158736 03   RAS  .12982018 03   RAM  .18068666 02   LOM  .21983585 03
 DUT  .35000000 02     DT  .19200000 04     DR  .10092690 01   SHA  .29381981 06   DES  .18421028 02   DEM  .22655148 01


12 GOLDSTONE ECHO        1
    R .29715796 06    LAT .63205221 01    LON .23031949 03
  MIN .1652C333 04     HA .13104216 02    DEC .57147875 01    ELE .58211279 02    AZI .20535642 03
  CKC .25874717 03    CKM .63760968 00    CKT .63760968 00    PSS .99C17526 02    PSM .11271843 02
   UT .27533888 02    DHA .42110381-02    DDE .21609355-04    DEL-.14548830-02    DAZ .74593054-02
   ET .27524166 02    RGE .29172293 06    DRG .10930133 01    DDR .22755153-04    SLS .20139348 03
  RDI .63718803 04    PHI .35117429 02    THI .24319447 03    SPS .80873798 02    POL .13033163 03
   DT .97308281 00    RFB .96004999 09    RF1 .96004999 09    RF2 .29668212 08     FA .96004999 09
  BF1 .5350C245 05     F1 .82500245 05     F2 .10700049 06     XA .29668319 08    PRA .28323075 02
   D1 .2750CC81 04     D2 .35666830 04    DOP .14573378 00    DF1 .7287C685-01    DF2 .14574137 00


41 WOOMERA               1
    R .29715796 06    LAT .63205221 01    LON .23031949 03
  MIN .16520333 04     HA .26551394 03    DEC .69438264 01    ELE-.74149284 01    AZI .86348122 02
  CKC .25948191 03    CKM .13723481 01    CKT .13723481 01    PSS .97399545 02    PSM .11466447 02
   UT .27533888 02    DHA .41369963-02    DDE .27762641-04    DEL .35168203-02    DAZ-.21385764-02
   ET .27524166 02    RGE .29791318 06    DRG .62054384 00    DDR-.62784144-05    SLS .20157586 03
  RDI .63726015 04    PHI-.31212263 02    THI .13688755 03    SPS .82489020 02    POL .34898069 03
   DT .99373125 00    RFB .96004999 09    RF1 .96004999 09    RF2 .29668212 08     FA .96004999 09
  BF1 .51987217 05     F1 .80987217 05     F2 .10397443 06     XA .29668273 08    PRA .29606424 02
   D1 .26995739 04     D2 .34658145 04    DOP-.40209663-01    DF1-.20105879-01    DF2-.40211757-01
```

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.92523319 08	Y	-.11051811 09	Z	-.47953967 08	DX	.23952622 02	DY	.17145793 02	DZ	.73718474 01
R	.15190260 09	LAT	-.18402407 02	LON	.30993532 03	V	.30365283 02	PTH	-.40065121 00	AZ	.75313161 02
XE	.92263888 08	YE	-.11065928 09	ZE	-.47986681 08	DXE	.23177129 02	DYE	.16497034 02	DZE	.71535312 01
XT	.92624740 08	YT	-.11054155 09	ZT	-.47971664 08	DXT	.22825459 02	DYT	.17375081 02	DZT	.75666628 01
LTE	-.18421028 02	LOE	.30982018 03	LTT	-.18398848 02	LOT	.30996025 03	RST	.15198703 09	VST	.29667312 02
EPS	.81293C16 02	ESP	.11102813 00	SEP	.98596156 02	EPM	.13561645 03	EMP	.33172574 02	MEP	.11210969 02
MPS	.14308096 03	MSP	.23196850-01	SMP	.36895129 02	SEM	.1C98C543 03	EMS	.70059837 02	ESM	.13453449 00
RPM	.10558856 06	SPN	.80063164 02								
GCE	.10075370 03	GCT	.28189043 03	SIP	.14213945 03	CPT	.93403961 02	SIN	.92462452 02	D1	.49301771 00
REP	.29715797 06	VEP	.10343787 01	CPE	.98373619 02	CPS	.76991186 02	D2	.39815838 00	D3	.10793048-01

1 DAYS 4 HRS. 32 MIN. 2.000 SEC. 2356665704742020CC000000 J.C.= 2438607.12500000 JULY 30,1964 15 00 00.000
TFL 1 DAYS 22 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.2622CC37 06	Y	.14348756 06	Z	.33496428 05	DX	.76292918 00	DY	.64067752 00	DZ	.21624669 00
R	.30076523 06	DEC	.63943368 01	RA	.28689413 02	V	.10194563 01	PTH	.77383183 02	AZ	.61541720 02
R	.30076522 06	LAT	.63943368 01	LON	.21541553 03	VE	.21623090 02	PTE	.26370045 01	AZE	.27028146 03
XS	-.92347308 08	YS	.11059986 09	ZS	.47960915 08	DXS	-.23164650 02	DYS	-.16512167 02	DZS	-.71600819 01
XM	.35956947 06	YM	.12088167 06	ZM	.16502844 05	DXM	-.36123835 00	DYM	.87482906 00	DZM	.41269511 00
XT	.35956947 06	YT	.12088167 06	ZT	.16502844 05	DXT	-.36123835 00	DYT	.87482906 00	DZT	.41269511 00
RS	.15185718 09	VS	.29334611 02	RM	.37970373 06	VM	.10325387 01	RT	.37970373 06	VT	.10325387 01
GED	.64375482 01	ALT	.29438729 06	LOS	.31658690 03	RAS	.12986079 03	RAM	.18581845 02	LOM	.20530796 03
DUT	.35000000 02	DT	.19200000 04	DR	.99483924 00	SHA	.29747503 06	DES	.18410871 02	DEM	.24909964 01

12 GOLDSTONE ECHO 1

R	.30076522 06	LAT	.63943368 01	LON	.21541553 03				
MIN	.1712C333 04	HA	.28251873 02	DEC	.57880149 01	ELE	.50793581 02	AZI	.22816028 03
CKC	.25884316 03	CKM	.71915872 00	CKT	.71915872 00	PSS	.99132188 02	PSM	.10799697 02
UT	.28533888 02	DHA	.42035713-02	DDE	.19109323-04	DEL	-.25465614-02	DAZ	.52482161-02
ET	.28524166 02	RGE	.29580085 06	DRG	.11710075 01	DDR	.2C273184-04	SLS	.20151406 03
RDI	.63718803 04	PHI	.35117429 02	THI	.24319447 03	SPS	.80757651 02	POL	.14751514 03
DT	.98668529 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.53750012 05	F1	.82750012 05	F2	.10750002 06	XA	.29668327 08	PRA	.28216481 02
D1	.27583337 04	D2	.35833342 04	DOP	.12983818 00	DF1	.64922471-01	DF2	.12984494 00

41 WGOMERA 1

R	.30076522 06	LAT	.63943368 01	LON	.21541553 03				
MIN	.1712C333 04	HA	.28044451 03	DEC	.7042900B 01	ELE	.51828328 01	AZI	.78526661 02
CKC	.25952882 03	CKM	.14048265 01	CKT	.14048265 01	PSS	.97303149 02	PSM	.11085329 02
UT	.28533888 02	DHA	.41576501-02	DDE	.27176671-04	DEL	.34702360-02	DAZ	-.22417376-02
ET	.28524166 02	RGE	.30012259 06	DRG	.61140557 00	DDR	.12C24502-05	SLS	.20164004 03
RDI	.63726015 04	PHI	-.31212263 02	THI	.13688755 03	SPS	.82584564 02	POL	.34729662 03
DT	.10011011 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.51957953 05	F1	.80957953 05	F2	.10391591 06	XA	.29668272 08	PRA	.29716916 02
D1	.26985984 04	D2	.34638635 04	DOP	.77010078-02	DF1	.38567044-02	DF2	.77014088-02

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.92609508 08	Y	-.11045637 09	Z	-.47927419 08	DX	.23927579 02	DY	.17152844 02	DZ	.73763285 01
R	.15190183 09	LAT	-.18391950 02	LON	.30997735 03	V	.30350607 02	PTH	-.40077330 00	AZ	.75297496 02
XE	.92347308 08	YE	-.11059986 09	ZE	-.47960915 08	DXE	.23164650 02	DYE	.16512167 02	DZE	.71600819 01
XT	.92706877 08	YT	-.11047897 09	ZT	-.47944412 08	DXT	.22803412 02	DYT	.17386996 02	DZT	.75727770 01
LTE	-.18410871 02	LOE	.30986079 03	LTT	-.18388526 02	LOT	.31000122 03	RST	.15198301 09	VST	.29658896 02
EPS	.81405140 02	ESP	.11212418 00	SEP	.98482653 02	EPM	.13540999 03	EMP	.33785173 02	MEP	.10804831 02
MPS	.14317535 03	MSP	.19782341-01	SMP	.36801730 02	SEM	.10928587 03	EMS	.70579015 02	ESM	.13525975 00
RPM	.10139304 06	SPN	.80190040 02								
GCE	.10074006 03	GCT	.28187599 03	SIP	.14219488 03	CPT	.93436839 02	SIN	.92456368 02	D1	.51342401 00
REP	.30076523 06	VEP	.10194563 01	CPE	.98389672 02	CPS	.76995324 02	D2	.41530237 00	D3	.11744828-01

1 DAYS 5 HRS. 32 MIN. 2.000 SEC. 2356665723002020C0000000 J.C.= 2438607.16666666 JULY 30,1964 16 00 00.000
TFL 1 DAYS 23 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.2649250 3 06	Y	.14577961 06	Z	.34271185 05	DX	.75085091 00	DY	.63271022 00	DZ	.21417486 00
R	.30432134 06	DEC	.64660887 01	RA	.28822554 02	V	.10049727 01	PTH	.77422616 02	AZ	.61512573 02
R	.30432134 06	LAT	.64660887 01	LON	.20050761 03	VE	.21886196 02	PTE	.25693438 01	AZE	.27027360 03
XS	-.92430678 08	YS	.11054039 09	ZS	.47935129 08	DXS	-.23152161 02	DYS	-.16527292 02	DZS	-.71666291 01
XM	.35825182 06	YM	.12402513 06	ZM	.17987699 05	DXM	-.37078602 00	DYM	.87152409 00	DZM	.41221886 00
XT	.35825182 06	YT	.12402513 06	ZT	.17987659 05	DXT	-.37078602 00	DYT	.87152409 00	DZT	.41221886 00
RS	.15185646 09	VS	.29334868 02	RM	.37953940 06	VM	.10329380 01	RT	.37953940 06	VT	.10329380 01
GED	.65097767 01	ALT	.29794341 06	LOS	.30158644 03	RAS	.12990139 03	RAM	.19095618 02	LOM	.19078067 03
DUT	.35000000 02	DT	.19200000 04	DR	.98085618 00	SHA	.30107715 06	DES	.18400709 02	DEM	.27164644 01

12 GOLDSTONE ECHO 1

R	.30432134 06	LAT	.64660887 01	LON	.20050761 03				
MIN	.1772C333 04	HA	.43364988 02	DEC	.58527181 01	ELE	.4C558410 02	AZI	.24403635 03
CKC	.25891931 03	CKM	.77764563 00	CKT	.77764563 00	PSS	.99217218 02	PSM	.10327264 02
UT	.29533888 02	DHA	.41920020-02	DDE	.16894619-04	DEL	-.3U714974-02	DAZ	.37126989-02
ET	.29524166 02	RGE	.30013969 06	DRG	.12369614 01	DDR	.16113158-04	SLS	.20164054 03
RDI	.63718803 04	PHI	.35117429 02	THI	.24319447 03	SPS	.80671030 02	POL	.15742953 03
DT	.10011581 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.53961222 05	F1	.82961221 05	F2	.10792244 06	XA	.29668334 08	PRA	.28144428 02
D1	.27653740 04	D2	.35974148 04	DOP	.10319559 00	DF1	.5160C482-01	DF2	.10320096 00

41 WGOMERA 1

R	.30432134 06	LAT	.64660887 01	LON	.20050761 03				
MIN	.1772C333 04	HA	.29544739 03	DEC	.71387608 01	ELE	.17471957 02	AZI	.69937120 02
CKC	.25959708 03	CKM	.14554125 01	CKT	.14554125 01	PSS	.97275419 02	PSM	.10681717 02
UT	.29533888 02	DHA	.41769514-02	DDE	.25977535-04	DEL	.33403223-02	DAZ	-.25723269-02
ET	.29524166 02	RGE	.30234732 06	DRG	.62890047 00	DDR	.84322891-05	SLS	.20170419 03
RDI	.63726015 04	PHI	-.31212263 02	THI	.13688755 03	SPS	.82611454 02	POL	.34373619 03
DT	.10085220 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.52013978 05	F1	.81013978 05	F2	.10402796 06	XA	.29668273 08	PRA	.29755099 02
D1	.27004659 04	D2	.34675986 04	DOP	.54004003-01	DF1	.27003407-01	DF2	.54006815-01

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.92695603 08	Y	-.11039461 09	Z	-.47900857 08	DX	.23903012 02	DY	.17160002 02	DZ	.73808040 01
R	.15190107 09	LAT	-.18381489 02	LON	.31001934 03	V	.30336379 02	PTH	-.40054534 00	AZ	.75281930 02
XE	.92436678 08	YE	-.11054039 09	ZE	-.47935129 08	DXE	.23152161 02	DYE	.16527292 02	DZE	.71666291 01
XT	.92788529 08	YT	-.11041636 09	ZT	-.47917141 08	DXT	.22781375 02	DYT	.17398816 02	DZT	.75788480 01
LTE	-.18400709 02	LOE	.30990139 03	LTT	-.18378197 02	LOT	.31004218 03	RST	.15197898 09	VST	.29650443 02
EPS	.81512859 02	ESP	.11342548 00	SEP	.98373573 02	EPM	.13521526 03	EMP	.34390939 02	MEP	.10393800 02
MPS	.14326249 03	MSP	.19782341-01	SMP	.36715583 02	SEM	.10876985 03	EMS	.71098663 02	ESM	.13544046 00
RPM	.97202361 05	SPN	.80311960 02								
GCE	.10072698 03	GCT	.28185833 03	SIP	.14223975 03	CPT	.93469363 02	SIN	.92446616 02	D1	.53556614 00
REP	.30432134 06	VEP	.10049727 01	CPE	.98405067 02	CPS	.76999465 02	C2	.43387840 00	D3	.12819836-01

1 DAYS 6 HRS. 32 MIN. 2.000 SEC. 23566657410420200000000 J.C.= 2438607.20833333 JULY 30,1964 17 00 00.000
TFL 2 DAYS 0 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.26760708 06	Y	.14804319 06	Z	.35038480 05	DX	.73925904 00	DY	.62484641 00	DZ	.21209712 00
R	.30782792 06	DEC	.65358523 01	RA	.28951851 02	V	.99091985 00	PTH	.77469191 02	AZ	.61477776 02
R	.30782792 06	LAT	.65358523 01	LON	.18559584 03	VE	.22133762 02	PTE	.25048045 01	AZE	.27026600 03
XS	-.92514004 08	YS	.11048086 09	ZS	.47909316 08	DXS	-.23139659 02	DYS	-.16542411 02	DZS	-.71731738 01
XM	.35689983 06	YM	.12715654 06	ZM	.19470773 05	DXM	-.38031125 00	DYM	.86813265 00	DZM	.41170278 00
XT	.35689983 06	YT	.12715654 06	ZT	.19470773 05	DXT	-.38031125 00	DYT	.86813265 00	DZT	.41170278 00
RS	.15185573 09	VS	.29335126 02	RM	.37937499 06	VM	.10333388 01	RT	.37937499 06	VT	.10333388 01
GED	.65800035 01	ALT	.30145000 06	LOS	.24658558 03	RAS	.12994199 03	RAM	.19610006 02	LOM	.17625399 03
DUT	.35000000 02	DT	.19200000 04	DR	.96731564 00	SHA	.30462783 06	DES	.18390535 02	DEM	.29418990 01

12 GOLDSTONE ECHO 1

R	.30782792 06	LAT	.65358523 01	LON	.18559584 03		
MIN	.18320333 04	HA	.58436612 02	DEC	.59101328 01	ELE	.29025042 02
CKC	.25897236 03	CKM	.80939449 00	CKT	.80939449 00	PSS	.99260120 02
UT	.30533889 02	DHA	.41773767-02	DDE	.15075259-04	DEL	-.33026484-02
ET	.30524166 02	RGE	.30468591 06	DRG	.12854080 01	DDR	.10611138-04
RDI	.63716803 04	PHI	.35117429 02	THI	.24319447 03	SPS	.80626450 02
DT	.10163226 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08
BF1	.54116366 05	F1	.83116366 05	F2	.10823273 06	XA	.29668338 08
D1	.27705455 04	D2	.36077577 04	DOP	.67958285-01	DF1	.33980912-01

AZI	.25574333 03		
PSM	.98586423 01		
DAZ	.28837195-02		
SLS	.20177112 03		
PDL	.16261547 03		
FA	.96004999 09		
PRA	.28119873 02		
DF2	.67961823-01		

41 ROMERA 1

R	.30782792 06	LAT	.65358523 01	LON	.18559584 03		
MIN	.18320333 04	HA	.31051543 03	DEC	.72292369 01	ELE	.29077332 02
CKC	.25968219 03	CKM	.15192219 01	CKT	.15192219 01	PSS	.97310330 02
UT	.30533889 02	DHA	.41936505-02	DDE	.24194103-04	DEL	.30789181-02
ET	.30524166 02	RGE	.30468052 06	DRG	.67119977 00	DDR	.14898450-04
RDI	.63726015 04	PHI	-.31212263 02	THI	.13688755 03	SPS	.82575680 02
DT	.10163047 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08
BF1	.52149437 05	F1	.81149437 05	F2	.10429887 06	XA	.29668278 08
D1	.27045812 04	D2	.34766291 04	DOP	.95416076-01	DF1	.47710522-01

AZI	.59649435 02		
PSM	.10256343 02		
DAZ	-.32015543-02		
SLS	.20177096 03		
PDL	.33775813 03		
FA	.96004999 09		
PRA	.29728128 02		
DF2	.95421045-01		

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.92781611 08	Y	-.11033282 09	Z	-.47874277 08	DX	.23878918 02	DY	.17167257 02	DZ	.73852709 01
R	.15190031 09	LAT	-.18371019 02	LON	.31006132 03	V	.30322593 02	PTH	-.39995112 00	AZ	.75266464 02
XE	.92514004 08	YE	-.11048086 09	ZE	-.47909316 08	DXE	.23139659 02	DYE	.16542411 02	DZE	.71731738 01
XT	.92870903 08	YT	-.11035370 09	ZT	-.47889845 08	DXT	.22759348 02	DYT	.17410543 02	DZT	.75848766 01
LTE	-.18396535 02	LOE	.30994199 03	LTT	-.18367860 02	LOT	.31008412 03	RST	.15197494 09	VST	.29641951 02
EPS	.81616307 02	ESP	.11471201 00	SEP	.98268787 02	EPM	.13503240 03	EMP	.34989583 02	MEP	.99780036 01
MPS	.14334209 03	MSP	.22117329-01	SMP	.36636970 02	SEM	.10824537 03	EMS	.71618783 02	ESM	.13580115 00
RPM	.93015056 05	SPN	.80429090 02								
GCE	.10071443 03	GCT	.28183702 03	SIP	.14227329 03	CPT	.93501674 02	SIN	.92432880 02	D1	.55968419 00
REP	.30782792 06	VEP	.99091985 00	CPE	.98419905 02	CPS	.77003609 02	C2	.45408512 00	D3	.14040618-01

1 DAYS 7 HRS. 32 MIN. 2.000 SEC. 23566657571020200000000 J.C.= 2438607.25000000 JULY 30,1964 18 00 00.000
TFL 2 DAYS 1 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.27024828 06	Y	.15027863 06	Z	.35798278 05	DX	.72815944 00	DY	.61707509 00	DZ	.21000936 00
R	.31128654 06	DEC	.66036864 01	RA	.29077351 02	V	.97729307 00	PTH	.77524388 02	AZ	.61436386 02
R	.31128654 06	LAT	.66036864 01	LON	.17068031 03	VE	.22383923 02	PTE	.24432337 01	AZE	.27025862 03
XS	-.92597287 08	YS	.11042128 09	ZS	.47883480 08	DXS	-.23127146 02	DYS	-.16557523 02	DZS	-.71797156 01
XM	.35551359 06	YM	.13027559 06	ZM	.20951918 05	DXM	-.38981303 00	DYM	.86465304 00	DZM	.41114683 00
XT	.35551359 06	YT	.13027559 06	ZT	.20951918 05	DXT	-.38981303 00	DYT	.86465304 00	DZT	.41114683 00
RS	.15185501 09	VS	.29335384 02	RM	.37921053 06	VM	.10337412 01	RT	.37921053 06	VT	.10337412 01
GED	.66482875 01	ALT	.30490862 06	LOS	.27158551 03	RAS	.12998259 03	RAM	.20125025 02	LOM	.16172795 03
DUT	.35000000 02	DT	.19200000 04	DR	.95421729 00	SHA	.30812862 06	DES	.18380354 02	DEM	.31672842 01

12 GOLDSTONE ECHO 1

R	.31128654 06	LAT	.66036864 01	LON	.17068031 03		
MIN	.18920333 04	HA	.73439882 02	DEC	.59618261 01	ELE	.16955478 02
CKC	.25900076 03	CKM	.81238867 00	CKT	.81238867 00	PSS	.99252124 02
UT	.31533888 02	DHA	.41609058-02	DDE	.13725609-04	DEL	-.33842857-02
ET	.31524166 02	RGE	.30936865 06	DRG	.13122581 01	DDR	.41909628-05
RDI	.63718803 04	PHI	.35117429 02	THI	.24319447 03	SPS	.80632699 02
DT	.10319426 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08
BF1	.54202351 05	F1	.83202350 05	F2	.10840470 06	XA	.29668341 08
D1	.27734116 04	D2	.36134900 04	DOP	.26840727-01	DF1	.13421062-01

AZI	.26531583 03		
PSM	.93968081 01		
DAZ	.24900791-02		
SLS	.20190360 03		
PDL	.16482061 03		
FA	.96004999 09		
PRA	.28151667 02		
DF2	.26842124-01		

41 ROMERA 1

R	.31128654 06	LAT	.66036864 01	LON	.17068031 03		
MIN	.18920333 04	HA	.32563723 03	DEC	.73123518 01	ELE	.39367791 02
CKC	.25977845 03	CKM	.15900932 01	CKT	.15900932 01	PSS	.97397822 02
UT	.31533888 02	DHA	.42066506-02	DDE	.21906315-04	DEL	.25882341-02
ET	.31524166 02	RGE	.30720543 06	DRG	.73467690 00	DDR	.20123572-04
RDI	.63726015 04	PHI	-.31212263 02	THI	.13688755 03	SPS	.82487264 02
DT	.10247269 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08
BF1	.52352715 05	F1	.81352715 05	F2	.10470543 06	XA	.29668284 08
D1	.27117572 04	D2	.34901810 04	DOP	.12888000 00	DF1	.64443354-01

AZI	.46398947 02		
PSM	.98111449 01		
DAZ	-.42333085-02		
SLS	.20184265 03		
PDL	.32834896 03		
FA	.96004999 09		
PRA	.29647401 02		
DF2	.12888671 00		

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.92867535 08	Y	-.11027100 09	Z	-.47847681 08	DX	.23855305 02	DY	.17174598 02	DZ	.73897249 01
R	.15185955 09	LAT	-.18360544 02	LON	.31010326 03	V	.30309246 02	PTH	-.39895988 00	AZ	.75251094 02
XE	.92597287 08	YE	-.11042128 09	ZE	-.47883480 08	DXE	.23127146 02	DYE	.16557523 02	DZE	.71797156 01
XT	.92952800 08	YT	-.11029100 09	ZT	-.47862528 08	DXT	.22737333 02	DYT	.17422176 02	DZT	.75908624 01
LTE	-.1838C354 02	LOE	.30998259 03	LTT	-.18357515 02	LOT	.31012405 03	RST	.15197088 09	VST	.29633422 02
EPS	.81715584 02	ESP	.11640527 00	SEP	.98168190 02	EPM	.13486171 03	EMP	.35580729 02	MEP	.95575556 01
MPS	.14341376 03	MSP	.18504685-01	SMP	.36566271 02	SEM	.10772444 03	EMS	.72139378 02	ESM	.13598114 00
RPM	.88826669 05	SPN	.80541559 02								
GCE	.1007C239 03	GCT	.28181162 03	SIP	.14229460 03	CPT	.93533929 02	SIN	.92414771 02	D1	.58606468 00
REP	.31128654 06	VEP	.97729307 00	CPE	.98434105 02	CPS	.77007757 02	D2	.47615942 00	D3	.15435147-01

1 DAYS 8 HRS. 32 MIN. 2.000 SEC. 2356665775142020000000000 J.C.= 2438607.29166666 JULY 30,1964 19 00 00.000
TFL 2 DAYS 2 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.27285C43 06	Y	.15248623 06	Z	.36550532 05	DX	.71756335 00	DY	.60938454 00	DZ	.20790673 00
R	.31465882 06	DEC	.66696429 01	RA	.29199242 02	V	.96409122 00	PTH	.77589923 02	AZ	.61387239 02
R	.31465882 06	LAT	.66696429 01	LON	.15576110 03	VE	.22630820 02	PTE	.23845018 01	AZE	.27025142 03
XS	-.9268C522 08	YS	.11036164 09	ZS	.47857623 08	DXS	-.23114621 02	DYS	-.16572627 02	DZS	-.71962541 01
XM	.35409321 06	YM	.13338194 06	ZM	.22430985 05	DXM	-.39929033 00	DYM	.86108721 00	DZM	.41055098 00
XT	.35409321 06	YT	.13338194 06	ZT	.22430985 05	DXT	-.39929033 00	DYT	.86108721 00	DZT	.41055098 00
RS	.15185428 09	VS	.29335642 02	RM	.37904602 06	VM	.10341451 01	RT	.37904602 06	VT	.10341451 01
GEO	.67146814 01	ALT	.30832090 06	LOS	.25658503 03	RAS	.13002316 03	RAM	.20640690 02	LOM	.14720754 03
DUT	.35000000 02	DT	.19200000 04	DR	.94156476 00	SHA	.31158114 06	DES	.18370165 02	DEM	.33926010 01

12 GOLDSTONE ECHO 1

R	.31465882 06	LAT	.66696429 01	LON	.15576110 03		
MIN	.1952C333 04	HA	.88388435 02	DEC	.60095649 01	ELE	.47669972 01
CKC	.2590C470 03	CKM	.78626747 00	CKT	.78626747 00	PSS	.99188587 02
UT	.32533888 02	DHA	.41438539-02	CDE	.12881163-04	DEL	-.33739396-02
ET	.32524166 02	RGE	.31410522 06	DRG	.13150463 01	DDR	-.26763263-05
RDI	.63718803 04	PHI	.35117429 02	THI	.24319447 03	SPS	.80694451 02
DT	.10477421 01	RFR	.96004999 09	RF1	.96004999 09	RF2	.29668212 08
RF1	.54211280 05	F1	.83211279 05	F2	.10842256 06	XA	.29668341 08
D1	.27737093 04	D2	.36140853 04	DOP	-.17140344-01	DF1	-.85706182-02

AZI	.27400190 03		
PSM	.89435972 01		
DAZ	.23746474-02		
SLS	.20203557 03		
POL	.16489088 03		
FA	.96004999 09		
PRA	.28244178 02		
DF2	-.17141236-01		

41 WOOMERA 1

R	.31465882 06	LAT	.66696429 01	LON	.15576110 03		
MIN	.1952C333 04	HA	.34079786 03	DEC	.73865089 01	ELE	.47251971 02
CKC	.25987939 03	CKM	.16609577 01	CKT	.16609577 01	PSS	.97524443 02
UT	.32533888 02	DHA	.42151138-02	CDE	.19242005-04	DEL	.17147975-02
ET	.32524166 02	RGE	.30998940 06	DRG	.81411996 00	DDR	.237113H4-04
RDI	.63726C15 04	PHI	-.31212263 02	THI	.13688755 03	SPS	.82359635 02
DT	.1034C132 01	RFR	.96004999 09	RF1	.96004999 09	RF2	.29668212 08
RF1	.52607122 05	F1	.81607122 05	F2	.10521424 06	XA	.29668292 08
D1	.27202374 04	D2	.35071415 04	DOP	.15185789 00	DF1	.75932900-01

AZI	.28720096 02		
PSM	.93490633 01		
DAZ	-.56163833-02		
SLS	.20192101 03		
POL	.31421866 03		
FA	.96004999 09		
PRA	.29527834 02		
DF2	.15186580 00		

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.92953372 08	Y	-.11020916 09	Z	-.47821072 08	DX	.23832184 02	DY	.17182012 02	DZ	.73941609 01
R	.15185879 09	LAT	-.18350064 02	LON	.31014518 03	V	.30296339 02	PTH	-.39753835 00	AZ	.75235825 02
XE	.92680522 08	YE	-.11036164 09	ZE	-.47857623 08	DXE	.23114621 02	DYE	.16572627 02	DZE	.71862541 01
XT	.93034615 08	YT	-.11022826 09	ZT	-.47835192 08	DXT	.22715330 02	DYT	.17433714 02	DZT	.75968051 01
LTE	-.1837C165 02	LOE	.31002318 03	LTT	-.18347165 02	LOT	.31016496 03	RST	.15196682 09	VST	.29624856 02
EPS	.81810773 02	ESP	.11703392 00	SEP	.98071697 02	EPM	.13470354 03	EMP	.36163917 02	MEP	.91325334 01
MPS	.14347707 03	MSP	.15639313-01	SMP	.36503930 02	SEM	.10720304 03	EMS	.72660445 02	ESM	.13634040 00
RPM	.84644694 05	SPN	.80649482 02								
GCE	.10069084 03	GCT	.28178156 03	SIP	.14230257 03	CPT	.93566314 02	SIN	.92391815 02	D1	.61505258 00
REP	.31469882 06	VEP	.96409122 00	CPE	.98447698 02	CPS	.77011908 02	D2	.50038672 00	D3	.17038527-01

1 DAYS 9 HRS. 32 MIN. 2.000 SEC. 2356666013202020000000000 J.C.= 2438607.33333333 JULY 30,1964 20 00 00.000
TFL 2 DAYS 3 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.27541535 06	Y	.15466628 06	Z	.37295185 05	DX	.70748861 00	DY	.60176237 00	DZ	.20578364 00
R	.31806635 06	DEC	.67337647 01	RA	.29317460 02	V	.95131750 00	PTH	.77667879 02	AZ	.61328862 02
R	.31806635 06	LAT	.67337647 01	LON	.14083825 03	VE	.22874594 02	PTE	.23284977 01	AZE	.27024437 03
XS	-.9276371S 08	YS	.11030195 09	ZS	.47831739 08	DXS	-.23102084 02	DYS	-.16587726 02	DZS	-.71927901 01
XM	.35263873 06	YM	.13647532 06	ZM	.23907840 05	DXM	-.4C874225 00	DYM	.85743463 00	DZM	.40991515 00
XT	.35263873 06	YT	.13647532 06	ZT	.23907840 05	DXT	-.4C874225 00	DYT	.85743463 00	DZT	.40991515 00
RS	.15185356 09	VS	.29335902 02	RM	.37888147 06	VM	.10345505 01	RT	.37888147 06	VT	.10345505 01
GEO	.67792282 01	ALT	.31168844 06	LOS	.24158455 03	RAS	.13C06376 03	RAM	.21157023 02	LOM	.13267781 03
DUT	.35000000 02	DT	.19200000 04	DR	.92936680 00	SHA	.31498697 06	DES	.18359966 02	DEM	.36178308 01

12 GOLDSTONE ECHO 1

R	.31806635 06	LAT	.67337647 01	LON	.14083825 03		
MIN	.2012C333 04	HA	.10327640 03	DEC	.60551769 01	ELE	-.72452947 01
CKC	.25898604 03	CKM	.73219499 00	CKT	.73219499 00	PSS	.99069045 02
UT	.33533888 02	DHA	.41274402-02	CDE	.12540138-04	DEL	-.32863959-02
ET	.33524166 02	RGE	.31880714 06	DRG	.12930294 01	DDR	-.95105533-05
RDI	.63718803 04	PHI	.35117429 02	THI	.24319447 03	SPS	.8C812202 02
DT	.10634260 01	RFR	.96004999 09	RF1	.96004999 09	RF2	.29668212 08
RF1	.5414C773 05	F1	.83140773 05	F2	.10828155 06	XA	.29668339 08
D1	.27713591 04	D2	.36093849 04	DOP	-.60909670-01	DF1	-.30456421-01

AZI	.28267416 03		
PSM	.84994429 01		
DAZ	.24786446-02		
SLS	.20216463 03		
POL	.16310734 03		
FA	.96004999 09		
PRA	.28397281 02		
DF2	-.60912842-01		

41 WOOMERA 1

R	.31806635 06	LAT	.67337647 01	LON	.14083825 03		
MIN	.2012C333 04	HA	.35597999 03	DEC	.7450064C9 01	ELE	.51146138 02
CKC	.25997815 03	CKM	.17243171 01	CKT	.17243171 01	PSS	.97674330 02
UT	.33533888 02	DHA	.42185475-02	CDE	.16366731-04	DEL	.38349045-03
ET	.33524166 02	RGE	.31307857 06	DRG	.90309985 00	DDR	.25388567-04
RDI	.63726015 04	PHI	-.31212263 02	THI	.13688755 03	SPS	.82208632 02
DT	.10443176 01	RFR	.96004999 09	RF1	.96004999 09	RF2	.29668212 08
RF1	.52892C70 05	F1	.81892070 05	F2	.10578414 06	XA	.29668301 08
D1	.27297356 04	D2	.35261380 04	DOP	.16259929 00	DF1	.81303880-01

AZI	.63618594 01		
PSM	.88737887 01		
DAZ	-.66396904-02		
SLS	.20200714 03		
POL	.29525031 03		
FA	.96004999 09		
PRA	.29386766 02		
DF2	.16260776 00		

HELIOCENTRIC EQUATORIAL COORDINATES

X	.93035130 08	Y	-.11014729 09	Z	-.47794444 08	DX	.23809572 02	DY	.17189489 02	DZ	.73985738 01
R	.15185863 09	LAT	-.18339576 02	LON	.31018709 03	V	.30283875 02	PTH	-.39564297 00	AZ	.75220653 02
XE	.92763715 08	YE	-.11030195 09	ZE	-.47831739 08	DXE	.23102084 02	DYE	.16587726 02	DZE	.71927901 01
XT	.93116353 08	YT	-.11016548 09	ZT	-.47807832 08	DXT	.22693341 02	DYT	.17445161 02	DZT	.76027053 01
LTE	-.18355966 02	LOE	.31006376 03	LTT	-.18336806 02	LOT	.31020586 03	RST	.15196274 09	VST	.29616253 02
EPS	.81901941 02	ESP	.11869406 00	SEP	.97979244 02	EPM	.13455843 03	EMP	.36738560 02	MEP	.87030038 01
MPS	.14353142 03	MSP	.18504685-01	SMP	.36450540 02	SEM	.10668117 03	EMS	.73181989 02	ESM	.13651968 00
RPM	.80458572 05	SPN	.80752945 02								
GCE	.10067976 03	GCT	.28174615 03	SIP	.14229581 03	CPT	.93599044 02	SIN	.92363428 02	D1	.64706723 00
REP	.31806635 06	VEP	.95131750 00	CPE	.98460690 02	CPS	.77016062 02	D2	.52711371 00	D3	.18895264-01

1 DAYS 10 HRS. 32 MIN. 2.000 SEC. 2356666031242020000000000 J.C.= 2438607.37500000 JULY 30,1964 21 00 00.000
TFL 2 DAYS 4 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC EQUATORIAL COORDINATES

X	.27794499 06	Y	.15681901 06	Z	.38032149 05	DX	.69796105 00	DY	.59419470 00	DZ	.20363338 00
R	.32139083 06	DEC	.67960868 01	RA	.29432070 02	V	.93898004 00	PTH	.77760761 02	AZ	.61259367 02
R	.32139082 06	LAT	.67960868 01	LON	.12591180 03	VE	.23115400 02	PTE	.22751326 01	AZE	.27023743 03
XS	-.92846863 08	YS	.11024221 09	ZS	.47805832 08	DXS	-.23089535 02	DYS	-.16602818 02	DZS	-.71993231 01
XM	.35115028 06	YM	.13955539 06	ZM	.25382334 05	DXM	-.41816775 00	DYM	.85369545 00	DZM	.40923931 00
XT	.35115028 06	YT	.13955539 06	ZT	.25382334 05	DXT	-.41816775 00	DYT	.85369545 00	DZT	.40923931 00
RS	.15185283 09	VS	.29336162 02	RM	.37871690 06	VM	.10349575 01	RT	.37871690 06	VT	.10349575 01
GED	.68415631 01	ALT	.31501292 06	LOS	.22658407 03	RAS	.13010435 03	RAM	.21674039 02	LOM	.11815376 03
DUT	.35000000 02	DT	.19200000 04	DR	.91763793 00	SHA	.31834774 06	DES	.18349758 02	DEM	.38429530 01

41 WOOMERA 1

R	.32139082 06	LAT	.67960868 01	LON	.12591180 03				
MIN	.20720333 04	HA	.11165229 02	DEC	.75043219 01	ELE	.49835918 02	AZI	.34268323 03
CKC	.26006814 03	CKM	.17727337 01	CKT	.17727337 01	PSS	.97830450 02	PSM	.83894262 01
UT	.34533888 02	DHA	.42168576-02	DDE	.13467244-04	DEL	-.10864992-02	DAZ	-.62592889-02
ET	.34524166 02	RGE	.31649460 06	DRG	.99447363 00	DDR	.25034476-04	SLS	.20210140 03
RDI	.63726015 04	PHI	-.31212263 02	THI	.13688755 03	SPS	.82051279 02	POL	.27491690 03
DT	.10557122 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.53184683 05	F1	.82184684 05	F2	.10636937 06	XA	.2966831C 08	PRA	.29242593 02
D1	.27394894 04	D2	.35456455 04	DOP	.16033154 00	DF1	.8C169945-01	DF2	.16033989 00

HELIOCENTRIC EQUATORIAL COORDINATES

X	.93124807 08	Y	-.11008539 09	Z	-.47767799 08	DX	.23787496 02	DY	.17197012 02	DZ	.74029565 01
R	.15189728 09	LAT	-.18329082 02	LON	.31022897 03	V	.30271867 02	PTH	-.39321399 00	AZ	.75205580 02
XE	.92846863 08	YE	-.11024221 09	ZE	-.47805832 08	DXE	.23089535 02	DYE	.16602818 02	DZE	.71993231 01
XT	.93198013 08	YT	-.11010265 09	ZT	-.47780450 08	DXT	.22671367 02	DYT	.17456513 02	DZT	.76085624 01
LTE	-.18349758 02	LOE	.31010435 03	LTT	-.18326440 02	LOT	.31024674 03	RST	.15195866 09	VST	.29607616 02
EPS	.81985125 02	ESP	.12033130 00	SEP	.97890791 02	EPM	.13442705 03	EMP	.37303937 02	MEP	.82690021 01
MPS	.14357611 03	MSP	.18504685-01	SMP	.36406812 02	SEM	.10615883 03	EMS	.73704009 02	ESM	.13723445 00
RPM	.76265684 05	SPN	.80852016 02								
GCE	.10066911 03	GCT	.28170459 03	SIP	.14227262 03	CPT	.93632380 02	SIN	.92328890 02	D1	.68262342 00
REP	.32139083 06	VEP	.93898004 00	CPE	.98473072 02	CPS	.77020220 02	D2	.55676614 00	D3	.21062515-01

1 DAYS 11 HRS. 32 MIN. 2.000 SEC. 2356666047302020000000000 J.C.= 2438607.41666666 JULY 30,1964 22 00 00.000

TFL 2 DAYS 5 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC EQUATORIAL COORDINATES

X	.28044137 06	Y	.15894454 06	Z	.38761305 05	DX	.68901666 00	DY	.58666600 00	DZ	.20144789 00
R	.32467394 06	DEC	.68566304 01	RA	.29543073 02	V	.92709342 00	PTH	.77871651 02	AZ	.61176304 02
R	.32467393 06	LAT	.68566304 01	LON	.11098174 03	VE	.23353402 02	PTE	.22243407 01	AZE	.27023057 03
XS	-.92929961 08	YS	.11018241 09	ZS	.47779903 08	DXS	-.23076975 02	DYS	-.16617902 02	DZS	-.72058529 01
XM	.34962795 06	YM	.14262183 06	ZM	.26854318 05	DXM	-.42756581 00	DYM	.84986982 00	DZM	.40852343 00
XT	.34962795 06	YT	.14262183 06	ZT	.26854318 05	DXT	-.42756581 00	DYT	.84986982 00	DZT	.40852343 00
RS	.15185210 09	VS	.29336423 02	RM	.37855230 06	VM	.10353659 01	RT	.37855230 06	VT	.10353659 01
GED	.69029076 01	ALT	.31829604 06	LOS	.21158358 03	RAS	.13014493 03	RAM	.22191755 02	LOM	.10363042 03
DUT	.35000000 02	DT	.19200000 04	DR	.90640017 00	SHA	.32166513 06	DES	.18339542 02	DEM	.40679513 01

41 WOOMERA 1

R	.32467393 06	LAT	.68566304 01	LON	.11098174 03				
MIN	.21320333 04	HA	.26335566 02	DEC	.75478029 01	ELE	.43771007 02	AZI	.32248089 03
CKC	.26014348 03	CKM	.17993326 01	CKT	.17993326 01	PSS	.97975936 02	PSM	.79000736 01
UT	.35533888 02	DHA	.42103572-02	DDE	.10731592-04	DEL	-.22021854-02	DAZ	-.49101414-02
ET	.35524166 02	RGE	.32023290 06	DRG	.10809582 01	DDR	.22694097-04	SLS	.20220339 03
RDI	.63726015 04	PHI	-.31212263 02	THI	.13688755 03	SPS	.81904437 02	POL	.25812444 03
DT	.10681818 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.53461640 05	F1	.82461640 05	F2	.10692328 06	XA	.29668318 08	PRA	.29113313 02
D1	.27487213 04	D2	.35641094 04	DOP	.14534275 00	DF1	.72675160-01	DF2	.14535032 00

51 JOBURG 85 FT. 1

R	.32467393 06	LAT	.68566304 01	LON	.11098174 03				
MIN	.21320333 04	HA	.27568780 03	DEC	.73552206 01	ELE	.18878634 01	AZI	.80903938 02
CKC	.25947372 03	CKM	.11295707 01	CKT	.11295707 01	PSS	.96689294 02	PSM	.80035673 01
UT	.35533888 02	DHA	.41578852-02	DDE	.24549580-04	DEL	.36873789-02	DAZ	-.18472178-02
ET	.35524166 02	RGE	.32440136 06	DRG	.49675663 00	DDR	-.79333701-07	SLS	.20231572 03
RDI	.63754784 04	PHI	-.25739277 02	THI	.27685332 02	SPS	.83189172 02	POL	.35329148 03
DT	.10820863 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.51590804 05	F1	.80590803 05	F2	.10318161 06	XA	.29668260 08	PRA	.30558861 02
D1	.26863601 04	D2	.34393869 04	DOP	-.50808711-03	DF1	-.25405679-03	DF2	-.50811356-03

HELIOCENTRIC EQUATORIAL COORDINATES

X	.93210402 08	Y	-.11002347 09	Z	-.47741142 08	DX	.23765991 02	DY	.17204568 02	DZ	.74073007 01
R	.15185654 09	LAT	-.18318583 02	LON	.31027082 03	V	.30260330 02	PTH	-.39018565 00	AZ	.75190610 02
XE	.92929961 08	YE	-.11018241 09	ZE	-.47779903 08	DXE	.23076975 02	DYE	.16617902 02	DZE	.72058529 01
XT	.93275588 08	YT	-.11003979 09	ZT	-.47753049 08	DXT	.22649409 02	DYT	.17467772 02	DZT	.76143762 01
LTE	-.18339542 02	LOE	.31014493 03	LTT	-.18316068 02	LOT	.31028760 03	RST	.15195456 09	VST	.29598944 02
EPS	.82072335 02	ESP	.12114162 00	SEP	.97806329 02	EPM	.13431034 03	EMP	.37859110 02	MEP	.78305493 01
MPS	.14361019 03	MSP	.15639313-01	SMP	.36373682 02	SEM	.10563604 03	EMS	.74226508 02	ESM	.13723445 00
RPM	.72076279 05	SPN	.80966726 02								
GCE	.10065890 03	GCT	.28165584 03	SIP	.14223085 03	CPT	.93666633 02	SIN	.92287292 02	D1	.72236091 00
REP	.32467394 06	VEP	.92709342 00	CPE	.98484834 02	CPS	.77024382 02	D2	.58987298 00	D3	.23614685-01

1 DAYS 12 HRS. 32 MIN. 2.000 SEC. 2356666065342020C000CCCC J.C.= 2438607.45833333 JULY 30,1964 23 00 00.000
TFL 2 DAYS 6 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.2829C667 06	Y	.16104303 06	Z	.39482522 05	DX	.68070431 00	DY	.57915834 00	DZ	.19921732 00
R	.32791753 06	DEC	.69154093 01	RA	.29650450 02	V	.91568022 00	PTH	.78004375 02	AZ	.61076434 02
R	.32791753 06	LAT	.69154093 01	LON	.96048049 02	VE	.23588779 02	PTE	.21760888 01	AZE	.27022373 03
XS	-.93013C20 08	YS	.11012256 09	ZS	.47753949 08	DXS	-.23C64402 02	DYS	-.16632980 02	DZS	-.72123799 01
XM	.348C7184 06	YM	.14567435 06	ZM	.28323658 05	DXM	-.43693551 00	DYM	.84595788 00	DZM	.40776746 00
XT	.34807184 06	YT	.14567435 06	ZT	.28323658 05	DXT	-.43693551 00	DYT	.84595788 00	DZT	.40776746 00
RS	.15185137 09	VS	.29336685 02	RM	.37838770 06	VM	.10357759 01	RT	.37838770 06	VT	.10357759 01
GED	.6962C754 01	ALT	.32153964 06	LOS	.19658310 03	RAS	.13C18550 03	RAM	.22710193 02	LOM	.89107788 02
DUT	.35CCCCCC 02	DT	.19200000 04	DR	.89568497 00	SHA	.32494089 06	DES	.18329317 02	DEM	.42928071 01

41 WOOMERA 1

R	.32791753 06	LAT	.69154093 01	LON	.96048049 02		
MIN	.2192C333 04	HA	.41474828 02	DEC	.75819897 01	ELE	.34528649 02	AZI	.30716719 03
CKC	.26019949 03	CKM	.17981805 01	CKT	.17981805 01	PSS	.98C95416 02	PSM	.74094411 01
UT	.36533888 02	DHA	.41997274-02	DDE	.83289430-05	DEL	-.28682916-02	DAZ	-.36623733-02
ET	.36524166 02	RGE	.32426339 06	DRG	.11557264 01	DDR	.18571253-04	SLS	.20231203 03
RDI	.63726015 04	PHI	-.31212263 02	THI	.13688755 03	SPS	.81783487 02	PCL	.24640473 03
DT	.10816261 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.53701077 05	F1	.82701076 05	F2	.10740215 06	XA	.29668326 08	PRA	.29015122 02
D1	.27567025 04	D2	.35800718 04	DOP	.11893828 00	DF1	.5947224C-01	DF2	.11894448 00

51 JUBURG 85 FT. 1

R	.32791753 06	LAT	.69154093 01	LON	.96048049 02		
MIN	.2192C333 04	HA	.29069165 03	DEC	.74420357 01	ELE	.15C31506 02	AZI	.73838244 02
CKC	.25953386 03	CKM	.11325388 01	CKT	.11325388 01	PSS	.96665730 02	PSM	.75704601 01
UT	.36533888 02	DHA	.41773496-02	DDE	.23572820-04	DEL	.36C26444-02	DAZ	-.21166884-02
ET	.36524166 02	RGE	.32620623 06	DRG	.51063471 00	DDR	.77303856-05	SLS	.20236392 03
RDI	.63754784 04	PHI	-.25739277 02	THI	.27685332 02	SPS	.83212053 02	PCL	.35030096 03
DT	.10881067 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.51635247 05	F1	.80635247 05	F2	.10327049 06	XA	.29668262 08	PRA	.30596081 02
D1	.26878415 04	D2	.34423498 04	DOP	.49508711-01	DF1	.24755645-01	DF2	.49511289-01

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.93295926 08	Y	-.10996151 09	Z	-.47714467 08	DX	.23745106 02	DY	.17212138 02	DZ	.74115971 01
R	.15185580 09	LAT	-.18308077 02	LON	.31031266 03	V	.30249289 02	PTH	-.38646320 00	AZ	.75175744 02
XE	.93013020 08	YE	-.11012256 09	ZE	-.47753949 08	DXE	.23064402 02	DYE	.16632980 02	DZE	.72123799 01
XT	.93361091 08	YT	-.10997688 09	ZT	-.47725626 08	DXT	.22627466 02	DYT	.17478938 02	DZT	.76201472 01
LTE	-.18329317 02	LOE	.31018550 03	LTT	-.18305689 02	LOT	.31C32845 03	RST	.15195046 09	VST	.29590237 02
EPS	.82151556 02	ESP	.12254679 00	SEP	.97725872 02	EPM	.13420948 03	EMP	.38402905 02	MEP	.73876046 01
MPS	.14363251 03	MSP	.15639313-01	SMP	.36352309 02	SEM	.10511277 03	EMS	.74749482 02	ESM	.13741256 00
RPM	.67876472 05	SPN	.81037083 02								
GCE	.10064910 03	GCT	.28159867 03	SIP	.14216780 03	CPT	.93702193 02	SIN	.92237488 02	D1	.76708482 00
REP	.32791753 06	VEP	.91568022 00	CPE	.98495964 02	CPS	.77028548 02	D2	.62710004 00	D3	.26650157-01

1 DAYS 13 HRS. 32 MIN. 2.000 SEC. 23566661034020200000000 J.D.= 2438607.50000000 JULY 31,1964 00 00 00.000
TFL 2 DAYS 7 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.28534327 06	Y	.16311449 06	Z	.40195605 05	DX	.67309005 00	DY	.57165053 00	DZ	.19692948 00
R	.33112355 06	DEC	.69724210 01	RA	.29754140 02	V	.90477387 00	PTH	.78163691 02	AZ	.60955393 02
R	.33112355 06	LAT	.69724210 01	LON	.81110621 02	VE	.23821733 02	PTE	.21303718 01	AZE	.27021685 03
XS	-.93C96028 08	YS	.11006265 09	ZS	.47727973 08	DXS	-.23C51817 02	DYS	-.16648050 02	DZS	-.72189038 01
XM	.346462C5 06	YM	.14871263 06	ZM	.29790200 05	DXM	-.44627572 00	DYM	.84195980 00	DZM	.40697139 00
XT	.34648205 06	YT	.14871263 06	ZT	.29790200 05	DXT	-.44627572 00	DYT	.84195980 00	DZT	.40697139 00
RS	.15185064 09	VS	.29336946 02	RM	.37822310 06	VM	.1C361872 01	RT	.37822310 06	VT	.10361872 01
GED	.70194641 01	ALT	.32474566 06	LOS	.18158255 03	RAS	.13022607 03	RAM	.23229364 02	LOM	.74585845 02
DUT	.35C00000 02	DT	.19200000 04	DR	.88553622 00	SHA	.32817687 06	DES	.18319083 02	DEM	.45174981 01

41 WOOMERA 1

R	.33112355 06	LAT	.69724210 01	LON	.81110621 02		
MIN	.2252C333 04	HA	.56569863 02	DEC	.76083346 01	ELE	.23479232 02	AZI	.29559334 03
CKC	.26023305 03	CKM	.17645431 01	CKT	.17645431 01	PSS	.98176144 02	PSM	.69205819 01
UT	.37533888 02	DHA	.41859409-02	DDE	.63932683-05	DEL	-.32327914-02	DAZ	-.28355471-02
ET	.37524166 02	RGE	.32853300 06	DRG	.12129354 01	DDR	.13004993-04	SLS	.20242565 03
RDI	.63726015 04	PHI	-.31212263 02	THI	.13688755 03	SPS	.81701189 02	PCL	.23875599 03
DT	.10958680 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.53884281 05	F1	.82884281 05	F2	.10776856 06	XA	.29668332 08	PRA	.28961204 02
D1	.27628C93 04	D2	.35922854 04	DOP	.83289567-01	DF1	.41646952-01	DF2	.83293904-01

51 JUBURG 85 FT. 1

R	.33112355 06	LAT	.69724210 01	LON	.81110621 02		
MIN	.2252C333 04	HA	.30576732 03	DEC	.75241841 01	ELE	.27712701 02	AZI	.65326001 02
CKC	.25961189 03	CKM	.11433835 01	CKT	.11433835 01	PSS	.96706082 02	PSM	.71203104 01
UT	.37533888 02	DHA	.41947761-02	DDE	.21963223-04	DEL	.34211851-02	DAZ	-.26707666-02
ET	.37524166 02	RGE	.32811059 06	DRG	.55166536 00	DDR	.14915769-04	SLS	.20241448 03
RDI	.63754784 04	PHI	-.25739277 02	THI	.27685332 02	SPS	.83117097 02	PCL	.34521186 03
DT	.10944590 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.51766642 05	F1	.80766642 05	F2	.10353328 06	XA	.29668266 08	PRA	.30566527 02
D1	.26922214 04	D2	.34511C95 04	DOP	.95526995-01	DF1	.47765985-01	DF2	.95531970-01

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.93381371 08	Y	-.10989954 09	Z	-.47687777 08	DX	.23724907 02	DY	.17219701 02	DZ	.74158332 01
R	.15189567 09	LAT	-.18297563 02	LON	.31035447 03	V	.30238781 02	PTH	-.38193222 00	AZ	.75160988 02
XE	.93C96028 08	YE	-.11006265 09	ZE	-.47727973 08	DXE	.23C51817 02	DYE	.16648050 02	DZE	.72189038 01
XT	.93442510 08	YT	-.10991394 09	ZT	-.47698183 08	DXT	.22605541 02	DYT	.17490010 02	DZT	.76258751 01
LTE	-.18315083 02	LOE	.31022607 03	LTT	-.18295303 02	LOT	.31C36928 03	RST	.15194635 09	VST	.29581496 02
EPS	.8222e735 02	ESP	.12393603 00	SEP	.97649473 02	EPM	.13412604 03	EMP	.38933809 02	MEP	.69401532 01
MPS	.14364154 03	MSP	.15639313-01	SMP	.36344223 02	SEM	.10458903 03	EMS	.75272939 02	ESM	.13794551 00
RPM	.63668168 05	SPN	.81123C53 02								
GCE	.10063969 03	GCT	.28153148 03	SIP	.14208000 03	CPT	.93739545 02	SIN	.92178004 02	D1	.81782370 00
REP	.33112355 06	VEP	.90477387 00	CPE	.98506431 02	CPS	.77032720 02	D2	.66929768 00	D3	.30301265-01

1 DAYS 14 HRS. 32 MIN. 2.000 SEC. 23566661214420200000000 J.D.= 2438607.56166666 JULY 31,1964 01 00 00.000
TFL 2 DAYS 8 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.28775386 06	Y	.16515888 06	Z	.40900327 05	DX	.66626289 00	DY	.56411675 00	DZ	.19456901 00
R	.33429414 06	DEC	.70276507 01	RA	.29854049 02	V	.89442217 00	PTH	.78355716 02	AZ	.60807115 02
R	.33429413 06	LAT	.70276516 01	LON	.66169465 02	VE	.24052495 02	PTE	.20872264 01	AZE	.27020989 03
XS	-.93178993 08	YS	.11000269 09	ZS	.47701973 08	DXS	-.23039221 02	DYS	-.16663114 02	DZS	-.72254246 01
XM	.34485869 06	YM	.15173636 06	ZM	.31253804 05	DXM	-.45558563 00	DYM	.83787571 00	DZM	.40613517 00
XT	.34485869 06	YT	.15173636 06	ZT	.31253804 05	DXT	-.45558563 00	DYT	.83787571 00	DZT	.40613517 00
RS	.15184991 09	VS	.29337209 02	RM	.37805852 06	VM	.10366001 01	RT	.37805852 06	VT	.10366001 01
GED	.7075C597 01	ALT	.32791626 06	LOS	.166582C5 03	RAS	.13026663 03	RAM	.23749292 02	LOM	.60064708 02
OUT	.35000000 02	DT	.19200000 04	DR	.87601457 00	SHA	.33137510 06	DES	.18308841 02	DEM	.47420099 01

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R	.33429413 06	LAT	.70276516 01	LON	.66169465 02						
MIN	.2312C333 04	HA	.71611255 02	DEC	.76286894 01	ELE	.11456201 02	AZI	.28632993 03		
CKC	.26C24269 03	CKM	.16949584 01	CKT	.16949584 01	PSS	.98208847 02	PSM	.64355984 01		
UT	.38533888 02	DHA	.41701597-02	DDE	.50127182-05	DEL	-.34254738-02	DAZ	-.23600066-02		
ET	.38524166 02	RGE	.33297C06 06	DRG	.12481540 01	DDR	.64335196-05	SLS	.20254217 03		
RDI	.63726015 04	PHI	-.31212263 02	THI	.13688755 03	SPS	.81666836 02	POL	.23394906 03		
DT	.11106684 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09		
BF1	.53997065 05	F1	.82997065 05	F2	.10799413 06	XA	.29668335 08	PRA	.28960876 02		
D1	.27665688 04	D2	.35998043 04	DOP	.41203023-01	DF1	.2C602585-01	DF2	.41205170-01		

51 JOBURG 85 FT. 1

R	.33429413 06	LAT	.70276516 01	LON	.66169465 02						
MIN	.2312C333 04	HA	.32089025 03	DEC	.75994861 01	ELE	.39448095 02	AZI	.54068729 02		
CKC	.2597C262 03	CKM	.11548765 01	CKT	.11548765 01	PSS	.96802165 02	PSM	.66543691 01		
UT	.38533888 02	DHA	.42090121-02	DDE	.19784018-04	DEL	.30565745-02	DAZ	-.36773648-02		
ET	.38524166 02	RGE	.33020702 06	DRG	.61665612 00	DDR	.2C959892-04	SLS	.20246979 03		
RDI	.63754784 04	PHI	-.25739277 02	THI	.27685332 02	SPS	.83C74152 02	POL	.33695662 03		
DT	.11014519 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09		
BF1	.51974767 05	F1	.80974767 05	F2	.10394953 06	XA	.29668272 08	PRA	.30479662 02		
D1	.26991589 04	D2	.34649845 04	DOP	.13423616 00	DF1	.67121574-01	DF2	.13424315 00		

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.93466746 08	Y	-.10983753 09	Z	-.47661073 08	DX	.23705484 02	DY	.17227230 02	DZ	.74199936 01
R	.15185435 09	LAT	-.18287044 02	LON	.31039627 03	V	.30228856 02	PTH	-.37643819 00	AZ	.75146349 02
XE	.93178993 08	YE	-.11000269 09	ZE	-.47701973 08	DXE	.23039221 02	DYE	.16663114 02	DZE	.72254246 01
XT	.93523851 08	YT	-.10985095 09	ZT	-.47670719 08	DXT	.22583635 02	DYT	.17500989 02	DZT	.76315597 01
LTE	-.18308841 02	LOE	.31026663 03	LTT	-.18284910 02	LOT	.31041009 03	RST	.15194223 09	VST	.29572722 02
EPS	.82297776 02	ESP	.12472294 00	SEP	.97577223 02	EPM	.13406209 03	EMP	.39449828 02	MEP	.64880691 01
MPS	.14363530 03	MSP	.15639313-01	SMP	.36351403 02	SEM	.10406483 03	EMS	.75796881 02	ESM	.13829968 00
RPM	.59448984 05	SPN	.81204563 02								
GCE	.10063067 03	GCT	.28145225 03	SIP	.14196291 03	CPT	.93779296 02	SIN	.92106901 02	D1	.87591372 00
REP	.33429414 06	VFP	.89442217 00	CPE	.98516207 02	CPS	.77C36893 02	D2	.71757076 00	D3	.34749617-01

1 DAYS 15 HRS. 32 MIN. 2.000 SEC. 2356666137502020000000000 J.C.= 2438607.58333334 JULY 31,1964 02 00 00.000
TFL 2 DAYS 9 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.29014146 06	Y	.16717607 06	Z	.41596394 05	DX	.66C34382 00	DY	.55652480 00	DZ	.19211620 00
R	.33743171 06	DEC	.70810653 01	RA	.29950033 02	V	.88469341 00	PTH	.78588337 02	AZ	.60622991 02
R	.33743171 06	LAT	.70810653 01	LON	.51224384 02	VE	.24281340 02	PTE	.20467421 01	AZE	.27020274 03
XS	-.93261913 08	YS	.10994267 09	ZS	.47675950 08	DXS	-.23C26613 02	DYS	-.16678170 02	DZS	-.72319426 01
XM	.3432C186 06	YM	.15474524 06	ZM	.32714327 05	DXM	-.46486419 00	DYM	.83370581 00	DZM	.40525880 00
XT	.3432C186 06	YT	.15474524 06	ZT	.32714327 05	DXT	-.46486419 00	DYT	.83370581 00	DZT	.40525880 00
RS	.15184917 09	VS	.29337472 02	RM	.37789395 06	VM	.10370144 01	RT	.37789395 06	VT	.10370144 01
GED	.71288264 01	ALT	.33105383 06	LOS	.15158155 03	RAS	.13C3C72C 03	RAM	.24269992 02	LOM	.45544342 02
OUT	.35000000 02	DT	.19200000 04	DR	.86720385 00	SHA	.3345378C 06	DES	.18298590 02	DEM	.49663192 01

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R	.33743171 06	LAT	.70810653 01	LON	.51224384 02						
MIN	.2372C333 04	HA	.86594109 02	DEC	.76451408 01	ELE	-.1C647932 01	AZI	.27829780 03		
CKC	.26C22873 03	CKM	.15870670 01	CKT	.15870670 01	PSS	.98188248 02	PSM	.59555960 01		
UT	.39533888 02	DHA	.41536282-02	DDE	.42257126-05	DEL	-.35174148-02	DAZ	-.21393142-02		
ET	.39524166 02	RGE	.33748997 06	DRG	.12586451 01	DDR	-.64700582-06	SLS	.20265928 03		
RDI	.63726015 04	PHI	-.31212263 02	THI	.13688755 03	SPS	.81685744 02	POL	.23120257 03		
DT	.11257452 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09		
BF1	.54030661 05	F1	.83030660 05	F2	.10806132 06	XA	.29668336 08	PRA	.29019087 02		
D1	.27676887 04	D2	.36020441 04	DOP	-.41437033-02	DF1	-.2C719596-02	DF2	-.41439191-02		

51 JOBURG 85 FT. 1

R	.33743171 06	LAT	.70810653 01	LON	.51224384 02						
MIN	.2372C333 04	HA	.33606224 03	DEC	.76660864 01	ELE	.49289066 02	AZI	.38062092 02		
CKC	.25975988 03	CKM	.11582135 01	CKT	.11582135 01	PSS	.96942161 02	PSM	.61746617 01		
UT	.39533888 02	DHA	.42191235-02	DDE	.17148250-04	DEL	.23288620-02	DAZ	-.53245223-02		
ET	.39524166 02	RGE	.33257340 06	DRG	.70066843 00	DDR	.25418169-04	SLS	.20253182 03		
RDI	.63754784 04	PHI	-.25739277 02	THI	.27685332 02	SPS	.82933307 02	POL	.32368552 03		
DT	.11093453 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09		
BF1	.52243807 05	F1	.81243807 05	F2	.10448761 06	XA	.29668280 08	PRA	.30348735 02		
D1	.27081269 04	D2	.34829205 04	DOP	.16278888 00	DF1	.81398679-01	DF2	.16279736 00		

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.93552054 08	Y	-.10977550 09	Z	-.47634353 08	DX	.23686956 02	DY	.17234695 02	DZ	.74240588 01
R	.15189364 09	LAT	-.18276518 02	LON	.31043865 03	V	.30219584 02	PTH	-.36977875 00	AZ	.75131836 02
XE	.93261913 08	YE	-.10994267 09	ZE	-.47675950 08	DXE	.23026613 02	DYE	.16678170 02	DZE	.72319426 01
XT	.93605114 08	YT	-.10978793 09	ZT	-.47643235 08	DXT	.22561748 02	DYT	.17511876 02	DZT	.76372013 01
LTE	-.18298590 02	LOE	.31030720 03	LTT	-.18274503 02	LOT	.31045089 03	RST	.15193809 09	VST	.29563916 02
EPS	.82364535 02	ESP	.12647557 00	SEP	.97509271 02	EPM	.13402040 03	EMP	.39948364 02	MEP	.60312273 01
MPS	.14361118 03	MSP	.98911702-02	SMP	.36376458 02	SEM	.10354015 03	EMS	.76321301 02	ESM	.13847642 00
RPM	.55216154 05	SPN	.81281488 02								
GCE	.10062201 03	GCT	.28135832 03	SIP	.14181054 03	CPT	.93822268 02	SIN	.92021627 02	D1	.94312464 00
REP	.33743171 06	VFP	.88469341 00	CPE	.98525245 02	CPS	.77C41072 02	D2	.77338285 00	D3	.40250174-01

1 DAYS 16 HRS. 32 MIN. 2.000 SEC. 2356666155542020C0000000 J.C.= 2438607.62500000 JULY 31,1964 03 00 00.000
TFL 2 DAYS 10 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC EQUATORIAL COORDINATES

X	.2925C961 06	Y	.16916575 06	Z	.42283425 05	DX	.65549932 00	DY	.54883327 00	DZ	.10954528 00
R	.34053899 06	DEC	.71326068 01	RA	.30041885 02	V	.87568530 00	PTH	.78871977 02	AZ	.60390339 02
R	.34053899 06	LAT	.71326068 01	LON	.36275174 02	VE	.24508596 02	PTE	.20690830 01	AZE	.27019534 03
XS	-.93344787 08	YS	.10988261 09	ZS	.47649902 08	DXS	-.23013993 02	DYS	-.16693221 02	DZS	-.72384576 01
XM	.34151170 06	YM	.15773895 06	ZM	.34171623 05	DXM	-.47411039 00	DYM	.82945031 00	DZM	.40434225 00
XT	.34151170 06	YT	.15773895 06	ZT	.34171623 05	DXT	-.47411039 00	DYT	.82945031 00	DZT	.40434225 00
RS	.15184844 09	VS	.29337736 02	RM	.37772942 06	VM	.10374300 01	RT	.37772942 06	VT	.10374300 01
GED	.71807083 01	ALT	.33416112 06	LOS	.13658104 03	RAS	.13034775 03	RAM	.24791482 02	LOM	.31024769 02
OUT	.35000000 02	DT	.19200000 04	DR	.85922101 00	SHA	.33766791 06	DES	.18288331 02	DEM	.51904100 01

51 JOBURG 85 FT. L

R	.34053899 06	LAT	.71326068 01	LON	.36275174 02						
MIN	.2432C333 04	HA	.35126222 03	DEC	.77225900 01	ELE	.55476446 02	AZI	.15403388 02		
CKC	.25989705 03	CKM	.11432349 01	CKT	.11432349 01	PSS	.97111482 02	PSM	.56837767 01		
UT	.40533888 02	DHA	.42244925-02	CDE	.14210282-04	DEL	.99695572-03	DAZ	-.71738578-02		
ET	.40524166 02	RGE	.33526710 06	DRG	.79736760 00	DDR	.27965944-04	SLS	.20260189 03		
RDI	.63754784 04	PHI	-.25739277 02	THI	.27685332 02	SPS	.82763021 02	POL	.30360893 03		
DT	.11183305 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09		
BF1	.52553475 05	F1	.81553474 05	F2	.10510695 06	XA	.29668290 08	PRA	.30189815 02		
D1	.27184491 04	D2	.35035650 04	DOP	.17910552 00	DF1	.89557623-01	DF2	.17911525 00		

HELIOCENTRIC EQUATORIAL COORDINATES

X	.93637296 08	Y	-.10971344 09	Z	-.47607619 08	DX	.23669492 02	DY	.17242054 02	DZ	.74280030 01
R	.15185295 09	LAT	-.18265985 02	LON	.31047981 03	V	.30211066 02	PTH	-.36168498 00	AZ	.75117463 02
XE	.93344787 08	YE	-.10988261 09	ZE	-.47649902 08	DXE	.23013993 02	DYE	.16693221 02	DZE	.72384576 01
XI	.93686298 08	YT	-.10972487 09	ZT	-.47615730 08	DXT	.22535882 02	DYT	.17522671 02	DZT	.76427999 01
LTE	-.18288331 02	LOE	.31034775 03	LTT	-.18264101 02	LOT	.31049167 03	RST	.15193395 09	VST	.29555079 02
EPS	.82426799 02	ESP	.12743884 00	SEP	.97445826 02	EPM	.13400473 03	EMP	.40425844 02	MEP	.55694101 01
MPS	.14356560 03	MSP	.27453512-18	SMP	.36422480 02	SEM	.10301500 03	EMS	.76846205 02	ESM	.13882922 00
RPM	.50966442 05	SPN	.81353638 02								
GCE	.10061371 03	GCT	.28124617 03	SIP	.14161476 03	CPT	.93869527 02	SIN	.91918688 02	D1	.10218525 01
REP	.34053899 06	VEP	.87568530 00	CPE	.98533484 02	CPS	.77045255 02	D2	.83871514 00	D3	.47170202-01

1 DAYS 17 HRS. 32 MIN. 2.000 SEC. 2356666173602020000000C0 J.C.= 2438607.66666666 JULY 31,1964 04 00 00.000
TFL 2 DAYS 11 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC EQUATORIAL COORDINATES

X	.29486260 06	Y	.17112749 06	Z	.42960939 05	DX	.65196278 00	DY	.54098721 00	DZ	.18682176 00
R	.34361928 06	DEC	.71821906 01	RA	.30129312 02	V	.86753961 00	PTH	.79220673 02	AZ	.60089693 02
R	.34361928 06	LAT	.71821906 01	LON	.21321532 02	VE	.24734681 02	PTE	.19745120 01	AZE	.27018752 03
XS	-.93427617 08	YS	.10982248 09	ZS	.47623831 08	DXS	-.23001360 02	DYS	-.16708264 02	DZS	-.72449698 01
XM	.33978831 06	YM	.16071719 06	ZM	.35625547 05	DXM	-.48332324 00	DYM	.82510938 00	DZM	.40338552 00
XT	.33978831 06	YT	.16071719 06	ZT	.35625547 05	DXT	-.48332324 00	DYT	.82510938 00	DZT	.40338552 00
RS	.15184771 09	VS	.29338000 02	RM	.37756494 06	VM	.10378471 01	RT	.37756494 06	VT	.10378471 01
GED	.72306193 01	ALT	.33724141 06	LOS	.12158052 03	RAS	.13038831 03	RAM	.25313779 02	LOM	.16505994 02
OUT	.35000000 02	DT	.19200000 04	DR	.85223173 00	SHA	.34076722 06	DES	.18278062 02	DEM	.54142601 01

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R	.34361928 06	LAT	.71821906 01	LON	.21321532 02						
MIN	.2492C333 04	HA	.64726002 01	DEC	.77682481 01	ELE	.55906540 02	AZI	.34850634 03		
CKC	.25998752 03	CKM	.10985467 01	CKT	.10985467 01	PSS	.97293930 02	PSM	.51845247 01		
UT	.41533888 02	DHA	.42248863-02	CDE	.11150312-04	DEL	-.76928430-03	DAZ	-.73407665-02		
ET	.41524166 02	RGE	.33832100 06	DRG	.89952368 00	DDR	.28436504-04	SLS	.20268065 03		
RDI	.63754784 04	PHI	-.25739277 02	THI	.27685332 02	SPS	.82579482 02	POL	.27923263 03		
DT	.11285172 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09		
BF1	.5288C617 05	F1	.81880617 05	F2	.10576123 06	XA	.29668300 08	PRA	.30020512 02		
D1	.27293539 04	D2	.35253745 04	DOP	.18211959 00	DF1	.91064538-01	DF2	.18212908 00		

HELIOCENTRIC EQUATORIAL COORDINATES

X	.93722479 08	Y	-.10965135 09	Z	-.47580871 08	DX	.23653323 02	DY	.17249251 02	DZ	.74317915 01
R	.15185227 09	LAT	-.18255443 02	LON	.31052156 03	V	.30203441 02	PTH	-.35177865 00	AZ	.75103248 02
XE	.93427617 08	YE	-.10982248 09	ZE	-.47623831 08	DXE	.23001360 02	DYE	.16708264 02	DZE	.72449698 01
XI	.93767405 08	YT	-.10966176 09	ZT	-.47588206 08	DXT	.22518037 02	DYT	.17533373 02	DZT	.76483552 01
LTE	-.18278062 02	LOE	.31038831 03	LTT	-.18253688 02	LOT	.31053244 03	RST	.15192980 09	VST	.29546209 02
EPS	.82484267 02	ESP	.12877532 00	SEP	.97387188 02	EPM	.13402027 03	EMP	.40877393 02	MEP	.51023275 01
MPS	.14345163 03	MSP	.13988227-01	SMP	.36495889 02	SEM	.10248938 03	EMS	.77371595 02	ESM	.13882922 00
RPM	.46695840 05	SPN	.81420725 02								
GCE	.10060575 03	GCT	.28111102 03	SIP	.14136430 03	CPT	.93922544 02	SIN	.91793211 02	D1	.11154305 01
REP	.34361928 06	VEP	.86753961 00	CPE	.98540840 02	CPS	.77049442 02	D2	.91632450 00	D3	.56055740-01

1 DAYS 18 HRS. 32 MIN. 2.000 SEC. 2356666211642020000000C0 J.C.= 2438607.70833333 JULY 31,1964 05 00 00.000
TFL 2 DAYS 12 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC EQUATORIAL COORDINATES

X	.2972C571 06	Y	.17306059 06	Z	.43628304 05	DX	.65006997 00	DY	.53291129 00	DZ	.18389828 00
R	.34667654 06	DEC	.72296894 01	RA	.30211910 02	V	.88046731 00	PTH	.79653840 02	AZ	.59689630 02
R	.34667654 06	LAT	.72296894 01	LON	.63630614 01	VE	.24960133 02	PTE	.19434518 01	AZE	.27017913 03
XS	-.93512403 08	YS	.10976230 09	ZS	.47597737 08	DXS	-.22988717 02	DYS	-.16723300 02	DZS	-.72514790 01
XM	.33803181 06	YM	.16367964 06	ZM	.37075954 05	DXM	-.49250172 00	DYM	.82068325 00	DZM	.40238858 00
XT	.33803181 06	YT	.16367964 06	ZT	.37075954 05	DXT	-.49250172 00	DYT	.82068325 00	DZT	.40238858 00
RS	.15184697 09	VS	.29338265 02	RM	.37740052 06	VM	.10362656 01	RT	.37740052 06	VT	.10362656 01
GED	.72784316 01	ALT	.34029868 06	LOS	.13658001 03	RAS	.13042886 03	RAM	.25836903 02	LOM	.19880521 01
OUT	.35000000 02	DT	.19200000 04	DR	.84647670 00	SHA	.34384050 06	DES	.18267784 02	DEM	.56378515 01

51 JOBURG 85 FT. L

R	.34667654 06	LAT	.72296894 01	LON	.63630614 01						
MIN	.2552C333 04	HA	.21675648 02	DEC	.78029498 01	ELE	.50387496 02	AZI	.32497540 03		
CKC	.26000523 03	CKM	.10113811 01	CKT	.10113811 01	PSS	.97473026 02	PSM	.46796202 01		
UT	.42533888 02	DHA	.42204884-02	CDE	.81536446-05	DEL	-.21888742-02	DAZ	-.55877952-02		
ET	.42524166 02	RGE	.34174120 06	DRG	.99962827 00	DDR	.26844783-04	SLS	.20276802 03		
RDI	.63754784 04	PHI	-.25739277 02	THI	.27685332 02	SPS	.82399156 02	POL	.25624584 03		
DT	.11395258 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09		
BF1	.53201190 05	F1	.82201190 05	F2	.10640238 06	XA	.29668310 08	PRA	.29858532 02		
D1	.27400396 04	D2	.35467460 04	DOP	.17192553 00	DF1	.85967241-01	DF2	.17193448 00		

```
   HELICCENTRIC                                                                                    EQUATORIAL COORDINATES

    X  .938C7608 C8     Y -.10958924 09     Z -.47554109 08     DX  .23638786 02     DY  .17256211 02     DZ  .74353772 01
    R  .15185161 09   LAT -.18244896 02   LON  .31056329 03     V  .30196918 02   PTH -.33952956 00     AZ  .75089216 02
   XE  .9351C403 08    YE -.10976230 09    ZE -.47597737 08   DXE  .22988717 02   DYE  .16723300 02   DZE  .72514790 01
   XT  .93848434 08    YT -.10959862 09    ZT -.47560661 08   DXT  .22496215 02   DYT  .17543983 02   DZT  .76538675 01
  LTE -.18267784 C2   LOE  .31042886 03   LTT -.18243267 02   LOT  .31057118 03   RST  .15192565 09   VST  .29537310 02
  EPS  .82536519 02   ESP  .12972151 00   SEP  .97333777 02   EPM  .13407446 03   EMP  .41296025 02   MEP  .46295607 01
  MPS  .14338820 03   MSP  .13988227-01   SMP  .36602255 02   SEM  .10196329 03   EMS  .77897470 02   ESM  .13882922 00
  RPM  .42395362 05   SPN  .81482357 02
  GCE  .10055813 C3   GCT  .28094614 03   SIP  .14104298 03   CPT  .93983388 02   SIN  .91638166 02   DI  .12286419 01
  REP  .34667654 06   VEP  .86046731 00   CPE  .98547201 02   CPS  .77053636 02   D2  .10101673 01   D3  .67748614-01

   1 DAYS 19 HRS. 32 MIN.  2.000 SEC.        2356666227702020000C00000 J.C.= 2438607.75000000  JULY 31,1964 06 00 00.000
                                                TFL    2 DAYS 13 HRS.  9 MIN. 52.127 SEC.

      GECCENTRIC                                                                                   EQUATORIAL COORDINATES

    X  .29954565 C6     Y  .17496404 06     Z  .44284688 05     DX  .65031990 00     DY  .52449823 00     DZ  .18070782 00
    R  .34971581 C6   DEC  .72749266 01    RA  .30289116 02     V  .85479218 00   PTH  .80199042 02     AZ  .59135998 02
    R  .349715E1 C6   LAT  .72749266 01   LON  .35139919 03    VE  .25185687 02   PTE  .19165716 01   AZE  .27016991 03
   XS -.93593138 08    YS  .10970207 09    ZS  .47571620 08   DXS -.22976060 02   DYS -.16738329 02   DZS -.72579851 01
   XM  .33624233 06    YM  .16662601 06    ZM  .38522699 05   DXM -.50164483 00   DYM  .81617212 00   DZM  .40135144 00
   XT  .33624233 C6    YT  .16662601 06    ZT  .38522699 05   DXT -.50164483 00   DYT  .81617212 00   DZT  .40135144 00
   RS  .15184623 09    VS  .29338530 02    RM  .37723617 06    VM  .10386854 01    RT  .37723617 06    VT  .10386854 01
  GED  .73239671 01   ALT  .34333794 06   LOS  .91579480 02   RAS  .13C46940 03   RAM  .26360868 02   LOM  .34747095 03
  OUT  .35C0CCC0 02    DT  .24000000 03    DR  .84231656 00   SHA  .34689187 06   DES  .18257497 02   DEM  .58611628 01


51 JCBURG 85 FT.        1
    R  .34971581 06   LAT  .72749266 01   LON  .35139919 03
  MIN  .2612C333 04    HA  .36855064 02   DEC  .78272328 01   ELE  .40912504 02   AZI  .30816022 03
  CKC  .26C12519 03   CKM  .86697682 00   CKT  .86697682 00   PSS  .97633404 02   PSM  .41713135 01
   UT  .43533888 02   DHA  .42118851-02   CDE  .53878296-05   DEL-.29869204-02   DAZ-.38554950-02
   ET  .43524166 02   RGE  .34550728 06   DRG  .10905683 01   DDR  .0CC0C0000 00   SLS  .20286321 03
  RDI  .6375478H C4   PHI-.25739277 02   THI  .27685332 02   SPS  .82237419 02   POL  .24408752 03
   DT  .11524880 01   RFB  .96004999 09   RF1  .96004999 09   RF2  .29668212 08    FA  .96004999 09
  BF1  .53492415 05    F1  .82492415 05    F2  .10698483 06    XA  .29668319 08   PRA  .29720188 02
   D1  .27497471 04    D2  .35661610 04

   HELICCENTRIC                                                                                    EQUATORIAL COORDINATES

    X  .93892684 C8     Y -.10952711 09     Z -.47527335 08     DX  .23626380 02     DY  .17262827 02     DZ  .74386929 01
    R  .15189098 09   LAT -.18234341 02   LON  .31060500 03     V  .30191806 02   PTH -.32415223 00     AZ  .75075400 02
   XE  .93593138 08    YE -.10970207 09    ZE -.47571620 08   DXE  .22976060 02   DYE  .16738329 02   DZE  .72579851 01
   XT  .93929381 08    YT -.10953545 09    ZT -.47533097 08   DXT  .22474416 02   DYT  .17554501 02   DZT  .76593366 01
  LTE -.18257497 C2   LOE  .31046940 03   LTT -.18232840 02   LOT  .31061391 03   RST  .15192148 09   VST  .29528381 02
  EPS  .82582968 02   ESP  .13084791 00   SEP  .97286177 02   EPM  .13417798 03   EMP  .41671467 02   MEP  .41505511 01
  MPS  .14323888 03   MSP  .98911702-02   SMP  .36752520 02   SEM  .10143672 03   EMS  .78423832 02   ESM  .13935676 00
  RPM  .38C7C582 05   SPN  .81537969 02
  GCE  .10C59C82 C3   GCT  .28074178 03   SIP  .14062682 03   CPT  .94C55101 02   SIN  .91443042 02   DI  .13686194 01
  REP  .34971581 06   VEP  .85479218 00   CPE  .98552409 02   CPS  .77C57834 02   D2  .11261452 01   D3  .83606014-01



   SELENOCENTRIC                                                                                   EQUATORIAL COORDINATES

    X -.36696675 05     Y  .83380299 04     Z  .57619882 04     DX  .11519647 01     DY -.29167389 00     DZ -.22064362 00
    R  .38C7C582 05   DEC  .87051785 01    RA  .16719889 03     V  .12C86273 01   PTH -.87716475 02     AZ  .14269387 03
    R  .38C7C579 05   LAT  .44279185 01   LON  .31283846 03    VP  .12C93924 01   PTP -.86939448 02   AZP  .24851256 03
  LTS  .93672287 00   LNS  .27620483 03   LTE  .60749665 01   LNE  .35466258 03
  ALT  .36335582 05   SHA -.22779907 05   ALP  .39572978 01    DR -.12C76676 01    DP  .72475200-04   ASD  .26120590 01
  HGE  .27741703 03   SVL  .90352301-01   HNG  .14323898 03   SIA  .13156592 03

   1 DAYS 20 HRS. 32 MIN.  2.000 SEC.        2356666245742020000000000 J.C.= 2438607.79166666  JULY 31,1964 07 00 00.000
                                                TFL    2 DAYS 14 HRS.  9 MIN. 52.127 SEC.

      GECCENTRIC                                                                                   EQUATORIAL COORDINATES

    X  .30185148 06     Y  .17683638 06     Z  .44928966 05     DX  .65348655 00     DY  .51558820 00     DZ  .17715209 00
    R  .35274379 06   DEC  .73176409 01    RA  .30360124 02     V  .85103392 00   PTH  .80896896 02     AZ  .58327121 02
    R  .35274379 06   LAT  .73176409 01   LON  .33642914 03    VE  .25412386 02   PTE  .18949531 01   AZE  .27015948 03
   XS -.93675831 08    YS  .10964178 09    ZS  .47545678 08   DXS -.22963393 02   DYS -.16753351 02   DZS -.72644881 01
   XM  .33442001 06    YM  .16955599 06    ZM  .39965640 05   DXM -.51C75159 00   DYM  .81157621 00   DZM  .40027408 00
   XT  .33442001 06    YT  .16955599 06    ZT  .39965640 05   DXT -.51075159 00   DYT  .81157621 00   DZT  .40027408 00
   RS  .15184550 09    VS  .29338796 02    RM  .37707191 06    VM  .10391066 01    RT  .37707191 06    VT  .10391066 01
  GED  .73669630 01   ALT  .34636593 06   LOS  .76578955 02   RAS  .13C5C994 03   RAM  .26885695 02   LOM  .33295470 03
  OUT  .35C0C000 02    DT  .48000000 03    DR  .84031536 00   SHA  .34992729 06   DES  .18247204 02   DEM  .60841762 01


12 GOLDSTONE ECHO       1
    R  .35274379 06   LAT  .73176409 01   LON  .33642914 03
  MIN  .2672C333 04    HA  .26591393 03   DEC  .67200199 01   ELE  .54C33796 00   AZI  .82158576 02
  CKC  .25856492 03   CKM  .35904815 03   CKT  .35904815 03   PSS  .96647152 02   PSM  .37055922 01
   UT  .44533888 02   DHA  .41569020-02   CDE  .20087917-04   DEL  .33800606-02   DAZ  .23705088-02
   ET  .44524166 02   RGE  .35262614 06   DRG  .46463576 00   DDR  .0CC0C000 00   SLS  .20304036 03
  RDI  .63718803 04   PHI  .35117429 02   THI  .24319447 03   SPS  .83220723 02   POL  .54656954 02
   DT  .11762340 01   RFB  .96004999 09   RF1  .96004999 09   RF2  .29668212 08    FA  .96004999 09
  BF1  .51487941 05    F1  .80487940 05    F2  .10297588 06    XA  .29668257 08   PRA  .31211523 02
   D1  .2682E313 04    D2  .34325294 04


51 JCBURG 85 FT.        1
    R  .35274379 06   LAT  .73176409 01   LON  .33642914 03
  MIN  .2672C333 04    HA  .51997288 02   DEC  .78421763 01   ELE  .29351573 02   AZI  .29641710 03
  CKC  .26C16378 03   CKM  .64701613 00   CKT  .64701613 00   PSS  .97762105 02   PSM  .36610173 01
   UT  .44533888 02   DHA  .42000121-02   CDE  .29809273-05   DEL-.33895606-02   DAZ-.27677392-02
   ET  .44524166 02   RGE  .34957496 06   DRG  .11662947 01   DDR  .0C000000 00   SLS  .20296488 03
  RDI  .63754784 04   PHI-.25739277 02   THI  .27685332 02   SPS  .82107235 02   POL  .23522091 03
   DT  .1166C564 01   RFB  .96004999 09   RF1  .96004999 09   RF2  .29668212 08    FA  .96004999 09
  BF1  .53734920 05    F1  .82734919 05    F2  .10746984 06    XA  .29668327 08   PRA  .29619028 02
   D1  .27578307 04    D2  .35823280 04
```

HELICCENTRIC — EQUATORIAL COORDINATES

X	.93977723 08	Y	-.10946495 09	Z	-.47500549 08	DX	.23616879 02	DY	.17268939 02	DZ	.74416402 01
R	.15189039 09	LAT	-.18223777 02	LON	.31066671 03	V	.30188594 02	PTH	-.30445226 00	AZ	.75061850 02
XE	.93675831 08	YE	-.10964178 09	ZE	-.47545478 08	DXE	.22963393 02	DYE	.16753351 02	DZE	.72644881 01
XT	.94010252 08	YT	-.10947223 09	ZT	-.47505512 08	DXT	.22452641 02	DYT	.17564927 02	DZT	.76647622 01
LTE	-.18247204 02	LDE	.31050994 03	LTT	-.18222404 02	LOT	.31065463 03	RST	.15191731 09	VST	.29519423 02
EPS	.82622775 02	ESP	.13270400 00	SEP	.97245222 02	EPM	.13434759 03	EMP	.41987946 02	MEP	.36644520 01
MPS	.14302955 03	MSP	.98911702-02	SMP	.36962806 02	SEM	.10090967 03	EMS	.78950685 02	ESM	.13988231 00
RPM	.337CC8C1 05	SPN	.81586748 02								
GCE	.10058380 03	GCT	.28048323 03	SIP	.14007851 03	CPT	.94142350 02	SIN	.91191318 02	D1	.15465245 01
REP	.35274379 06	VEP	.85103392 00	CPE	.98556241 02	CPS	.77062037 02	D2	.12734973 01	D3	.10594114 00

SELENOCENTRIC — EQUATORIAL COORDINATES

X	-.32528530 C5	Y	.72803929 04	Z	.4963326З 04	DX	.11642381 01	DY	-.29598801 00	DZ	-.22312199 00
R	.3370C801 05	DEC	.84691126 01	RA	.16738422 03	V	.12218194 01	PTH	-.87381160 02	AZ	.14175382 03
R	.3370C797 05	LAT	.42833857 01	LON	.31255189 03	VP	.12215309 01	PTP	-.87695900 02	AZP	.23718913 03
LTS	.93754078 00	LNS	.27569590 03	LTE	.60460074 01	LNE	.35468368 03				
ALT	.31965801 C5	SHA	-.20264172 05	ALP	.37318012 01	DR	-.12205434 01	DP	.94910760-04	ASD	.29510310 01
HGE	.27737722 03	SVL	-.60483886-01	HNG	.14302959 03	SIA	.13139656 03				

1 DAYS 21 HRS. 32 MIN. 2.000 SEC. 2356666264002C200C000000 J.C.= 2438607.83333333 JULY 31,1964 08 00 00.000
TFL 2 DAYS 15 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.30425574 06	Y	.17867540 06	Z	.45559571 05	DX	.66083960 00	DY	.50592981 00	DZ	.17308063 00
R	.35576976 06	DEC	.73574524 01	RA	.30423753 02	V	.85007697 00	PTH	.41809612 02	AZ	.57047892 02
R	.35576976 06	LAT	.73574532 01	LON	.32145170 03	VE	.25641809 02	PTE	.18804313 01	AZE	.27014727 03
XS	-.93758477 08	YS	.10958144 09	ZS	.47519313 08	DXS	-.22950713 02	DYS	-.16768366 02	DZS	-.72709884 01
XM	.33256496 06	YM	.17246927 06	ZM	.41404629 05	DXM	-.51982096 00	DYM	.80689577 00	DZM	.39915652 00
XT	.33256496 06	YT	.17246927 06	ZT	.41404629 05	DXT	-.51982096 00	DYT	.80689577 00	DZT	.39915652 00
RS	.15184475 09	VS	.29339062 02	RM	.37690774 06	VM	.10395290 01	RT	.37690774 06	VT	.10395290 01
GED	.7407C377 01	ALT	.34939191 06	LOS	.61578427 02	RAS	.13055048 03	RAM	.27411400 02	LOM	.31843935 03
DUT	.35000000 02	DT	.48000000 03	DR	.84140632 00	SHA	.35295495 06	DES	.18236900 02	DEM	.63068711 01

12 GOLDSTONE ECMC 1

R	.35576976 06	LAT	.73574532 01	LON	.32145170 03				
MIN	.2732C333 04	HA	.28091168 03	DEC	.67907687 01	ELE	.12813196 02	AZI	.90670368 02
CKC	.2586C797 03	CKM	.35875498 03	CKT	.35875498 03	PSS	.96623413 02	PSM	.32169012 01
UT	.45533888 02	DHA	.41751939-02	DDE	.19107520-04	DEL	.34258040-02	DAZ	.23947444-02
ET	.45524166 02	RGE	.35430239 06	DRG	.47151283 00	DDR	.0CC0C000 00	SLS	.20308155 03
RDI	.63718803 04	PHI	.35117429 02	THI	.24319447 03	SPS	.83243927 02	POL	.53877080 02
DT	.11818254 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.51509964 05	F1	.80509964 05	F2	.10301993 06	XA	.29668258 08	PHA	.31254832 02
D1	.26836654 04	D2	.34339976 04						

51 JOBURG 85 FT. 1

R	.35576976 06	LAT	.73574532 01	LON	.32145170 03				
MIN	.2732C333 04	HA	.67092674 02	DEC	.78492132 01	ELE	.16739996 02	AZI	.28765745 03
CKC	.26017907 03	CKM	.32607792 00	CKT	.32607792 00	PSS	.97845690 02	PSM	.31489828 01
UT	.45533888 02	DHA	.41860843-02	DDE	.10020656-05	DEL	-.35935683-02	DAZ	-.21610266-02
ET	.45524166 02	RGE	.35388105 06	DRG	.12224776 01	DDR	.0CCCC000 00	SLS	.20307122 03
RDI	.63754784 04	PHI	-.25739277 02	THI	.27685332 02	SPS	.82C18067 02	POL	.22970088 03
DT	.11804199 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.53914839 05	F1	.82914838 05	F2	.10782968 06	XA	.29668332 08	PHA	.29564708 02
D1	.27638279 04	D2	.35943226 04						

HELICCENTRIC — EQUATORIAL COORDINATES

X	.94062732 08	Y	-.10940277 09	Z	-.47473754 08	DX	.23611552 02	DY	.17274296 02	DZ	.74440691 01
R	.15188983 09	LAT	-.18213204 02	LON	.31068841 03	V	.30188041 02	PTH	-.27848645 00	AZ	.75048632 02
XE	.93758477 08	YE	-.10958144 09	ZE	-.47519413 08	DXE	.22950713 02	DYE	.16768366 02	DZE	.72709884 01
XT	.94091C42 08	YT	-.10940897 09	ZT	-.47477908 08	DXT	.22438892 02	DYT	.17575262 02	DZT	.76701450 01
LTE	-.18236900 02	LDE	.31055047 03	LTT	-.18211962 02	LOT	.31069532 03	RST	.15191313 09	VST	.29510436 02
EPS	.82654708 02	ESP	.13288819 00	SEP	.97212148 02	EPM	.13461019 03	EMP	.42219744 02	MEP	.31700421 01
MPS	.14273373 03	MSP	.27453512-18	SMP	.37259578 02	SEM	.10038214 03	EMS	.79478025 02	ESM	.13970734 00
RPM	.29277831 05	SPN	.81627493 02								
GCE	.10057705 03	GCT	.28014700 03	SIP	.13933640 03	CPT	.94252699 02	SIN	.90855369 02	D1	.17809255 01
REP	.35576976 06	VEP	.85007697 00	CPE	.98558372 02	CPS	.77066246 02	D2	.14676029 01	D3	.13898481 00

SELENOCENTRIC — EQUATORIAL COORDINATES

X	-.28309219 05	Y	.62061249 04	Z	.41549422 04	DX	.11806606 01	DY	-.30096596 00	DZ	-.22607588 00
R	.29277831 05	DEC	.81586336 01	RA	.16763487 03	V	.12392135 01	PTH	-.86969370 02	AZ	.14108329 03
R	.29277828 05	LAT	.40961472 01	LON	.31235442 03	VP	.12386279 01	PTP	-.88295723 02	AZP	.21396657 03
LTS	.93835870 00	LNS	.27518695 03	LTE	.60164258 01	LNE	.35470520 03				
ALT	.27542831 05	SHA	-.17725590 05	ALP	.34415288 01	DR	-.12374804 01	DP	.12821345-03	ASD	.33973292 01
HGE	.27734529 03	SVL	-.26039925 00	HNG	.14273451 03	SIA	.13121286 03				

1 DAYS 22 HRS. 32 MIN. 2.000 SEC. 2356666302042020CC000000 J.C.= 2438607.87500000 JULY 31,1964 09 00 00.000
TFL 2 DAYS 16 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.30665715 06	Y	.18047769 06	Z	.46174246 05	DX	.67462434 00	DY	.49510021 00	DZ	.16825080 00
R	.3588C756 06	DEC	.73937872 01	RA	.30478191 02	V	.85355172 00	PTH	.83036595 02	AZ	.54755189 02
R	.3588C755 06	LAT	.73937881 01	LON	.30646508 03	VE	.25876534 02	PTE	.18763264 01	AZE	.27013279 03
XS	-.93841081 08	YS	.10952105 09	ZS	.47493125 08	DXS	-.22938021 02	DYS	-.16783374 02	DZS	-.72774855 01
XM	.33067734 06	YM	.17536555 06	ZM	.42839522 05	DXM	-.52885196 00	DYM	.80213104 00	DZM	.39799875 00
XT	.33067734 06	YT	.17536555 06	ZT	.42839522 05	DXT	-.52885196 00	DYT	.80213104 00	DZT	.39799875 00
RS	.15184402 09	VS	.29339329 02	RM	.37674368 06	VM	.10399527 01	RT	.37674368 06	VT	.10399527 01
GED	.7443E120 01	ALT	.35242971 06	LOS	.46577852 02	RAS	.13059101 03	RAM	.27938000 02	LOM	.30392488 03
DUT	.35000000 02	DT	.48000000 03	DR	.84725577 00	SHA	.35598700 06	DES	.18226587 02	DEM	.65292262 01

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12 GOLDSTONE ECHO      1
     R .3588C755 06    LAT .73937881 01    LON .306465C8 03
   MIN .27920333 04      HA .29597488 03    DEC .685676C2 01    ELE .2511C799 02    AZI .99695176 02
   CKC .25866618 03    CKM .35836115 03    CKT .35836115 03    PSS .96662369 02    PSM .27115615 01
    UT .46533888 02    DHA .41931339-02    DDE .17430840-04    DEL .33910623-02    DAZ .26671910-02
    ET .46524166 02    RGE .35605713 06    DRG .50846054 00    DDR .OCCOCCOC 00    SLS .20312446 03
   RDI .63718803 04    PHI .35117429 02    THI .24319447 03    SPS .83204223 02    POL .55039004 02
    DT .11876786 01    RFB .96004999 09    RF1 .96004999 09    RF2 .29668212 08      FA .96004999 09
   BF1 .51626284 05     F1 .80628284 05     F2 .10325657 06     XA .29668261 08    PRA .31232693 02
    D1 .26876C95 04     D2 .34418856 04

51 JOBURG 85 FT.       1
     R .3588C755 06    LAT .73937881 01    LON .306465C8 03
   MIN .27920333 04      HA .82136333 02    DEC .78498971 01    ELE .35990392 01    AZI .28050060 03
   CKC .26C17C84 03    CKM .35986381 03    CKT .35986381 03    PSS .97891127 02    PSM .26341449 01
    UT .46533888 02    DHA .41715346-02    DDE-.55802196-06    DEL-.36944540-02    DAZ-.18551733-02
    ET .46524166 02    RGE .35835092 06    DRG .12572140 01    DDR .OCCOCCOC 00    SLS .20318024 03
   RDI .63754784 04    PHI-.25739277 02    THI .27685332 02    SPS .81974974 02    POL .22635885 03
    DT .11953298 01    RFB .96004999 09    RF1 .96004999 09    RF2 .29668212 08      FA .96004999 09
   BF1 .54C26C78 05     F1 .83026079 05     F2 .10805216 06     XA .29668336 08    PRA .29562110 02
    D1 .27675359 04     D2 .36017385 04

     HELICCENTRIC                                                                          EQUATORIAL COORDINATES

     X  .94147738 08      Y -.10934057 09      Z -.47446951 08     DX  .23612645 02     DY  .17278474 02     DZ  .74457363 01
     R  .15188933 09    LAT -.18202623 02    LON  .31073011 03      V  .30191749 02    PTH -.24286957 00     AZ  .75035847 02
    XE  .93841081 08     YE -.10952105 09     ZE -.47493125 08    DXE  .22938021 02    DYE  .16783374 02    DZE  .72774855 01
    XT  .94171759 08     YT -.10934568 09     ZT -.47450286 08    DXT  .22409169 02    DYT  .17585505 02    DZT  .76754843 01
   LTE -.18226587 02    LOE  .31059101 03    LTT -.18201515 02    LOT  .31073601 03    RST  .15190895 09    VST  .29501422 02
   EPS  .82676872 02    ESP  .13417039 00    SEP  .97188839 02    EPM  .13501269 03    EMP  .42321765 02    MEP  .26655300 01
   MPS  .1423C466 03    MSP  .27453512-18    SMP  .37689618 02    SEM  .99854144 02    EMS  .80005854 02    ESM  .13988231 00
   RPM  .24783532 05    SPN  .81658354 02
   GCE  .10057052 03    GCT  .27969297 03    SIP  .13829032 03    CPT  .94395402 02    SIN  .90385061 02     D1  .21053502 01
   KEP  .3588C756 06    VEP  .85355172 00    CPE  .98558284 02    CPS  .77C7C465 02     D2  .17362615 01     D3  .19123775 00

     SELENOCENTRIC                                                                         EQUATORIAL COORDINATES

     X -.2402C18C 05      Y  .51121462 04      Z  .33347246 04     DX  .12C34763 01     DY -.30703083 00     DZ -.22974795 00
     R  .24783532 05    DEC  .77328344 01    RA  .16798517 03      V  .1263C943 01    PTH -.86437559 02     AZ  .14063072 03
     R  .24783529 05    LAT  .38422042 01   LON  .31229370 03     VP  .12611721 01    PTP -.88356697 02    AZP  .17487415 03
   LTS  .93917662 00    LNS  .27467801 03    LTE  .59862262 01    LNE  .35472715 03
   ALT  .23C48532 05    SHA -.15152247 05    ALP  .30543315 01     DR -.12606536 01     DP  .18144228-03    ASD  .40143412 01
   HGE  .27732313 03    SVL -.53657282 00    HNG  .14230791 03    SIA  .13C99835 03

  1 DAYS 23 HRS. 32 MIN.  2.000 SEC.        2356666320102020000000C0 J.C.= 2438607.91666666  JULY 31,1964 10 00 00.000
                                          TFL    2 DAYS 17 HRS.  9 MIN. 52.127 SEC.
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     GEOCENTRIC                                                                            EQUATORIAL COORDINATES

     X  .30912584 06      Y  .18223782 06      Z  .46769584 05     DX  .69925603 00     DY  .48232052 00     DZ  .16224610 00
     R  .36187954 06    DEC  .74257210 01    RA  .30520466 02      V  .86482130 00    PTH  .84740169 02     AZ  .49605216 02
     R  .36187954 06    LAT  .74257218 01   LON  .29146629 03     VE  .26121227 02    PTE  .18893020 01    AZE  .27011275 03
    XS -.93923636 08     YS  .10946060 09     ZS  .47466914 08    DXS -.22925317 02    DYS -.16798376 02    DZS -.72839797 01
    XM  .32875726 06     YM  .17824453 06     ZM  .44270176 05    DXM -.53784357 00    DYM  .79728227 00    DZM  .39680079 00
    XT  .32875726 06     YT  .17824453 06     ZT  .44270176 05    DXT -.53784357 00    DYT  .79728227 00    DZT  .39680079 00
    RS  .15184328 09     VS  .29339597 02     RM  .37657973 06     VM  .10403776 01     RT  .37657973 06     VT  .10403776 01
   GED  .74757560 01    ALT  .35550169 06    LOS  .31577353 02    RAS  .13063153 03    RAM  .28465515 02    LOM  .28941133 03
   OUT  .35C00000 02     DT  .48000000 03     DR  .86117974 00    SHA  .35904310 06    DES  .18216268 02    DEM  .67512227 01

12 GOLDSTONE ECHO      1
     R .36187954 06    LAT .74257218 01    LON .29146629 03
   MIN .2852C333 04      HA .31110106 03    DEC .69153180 01    ELE .37C90649 02    AZI .11031412 03
   CKC .25874221 03    CKM .35778772 03    CKT .35778772 03    PSS .96762823 02    PSM .21877033 01
    UT .47533888 02    DHA .42101157-02    DDE .14957147-04    DEL .32390718-02    DAZ .33112869-02
    ET .47524166 02    RGE .35800109 06    DRG .57697658 00    DDR .OCCOCCOC 00    SLS .20317176 03
   RDI .63718803 04    PHI .35117429 02    THI .24319447 03    SPS .83103069 02    POL .58758155 02
    DT .11941629 01    RFB .96004999 09    RF1 .96004999 09    RF2 .29668212 08      FA .96004999 09
   BF1 .51847699 05     F1 .8C847698 05     F2 .10369540 06     XA .29668269 08    PRA .31147578 02
    D1 .26949232 04     D2 .34565132 04

51 JOBURG 85 FT.       1
     R .36187954 06    LAT .74257218 01    LON .29146629 03
   MIN .2852C333 04      HA .97128948 02    DEC .78455642 01    ELE-.97891635 01    AZI .27404827 03
   CKC .26C14C59 03    CKM .35918610 03    CKT .35918610 03    PSS .97866619 02    PSM .21133145 01
    UT .47533888 02    DHA .41580253-02    DDE-.18174423-05    DEL-.37353535-02    DAZ-.17617848-02
    ET .47524166 02    RGE .36290897 06    DRG .12721292 01    DDR .OCCOCCOC 00    SLS .20329002 03
   RDI .63754784 04    PHI-.25739277 02    THI .27685332 02    SPS .81977776 02    POL .22463902 03
    DT .12105338 01    RFB .96004999 09    RF1 .96004999 09    RF2 .29668212 08      FA .96004999 09
   BF1 .54073843 05     F1 .83073843 05     F2 .10814769 06     XA .29668337 08    PRA .29610562 02
    D1 .27691280 04     D2 .36049228 04

     HELICCENTRIC                                                                          EQUATORIAL COORDINATES

     X  .94232762 08      Y -.10927836 09      Z -.47420144 08     DX  .23624573 02     DY  .17280696 02     DZ  .74462259 01
     R  .15188892 09    LAT -.18192030 02    LON  .31077181 03      V  .30202470 02    PTH -.19107625 00     AZ  .75023618 02
    XE  .93923636 08     YE -.10946060 09     ZE -.47466914 08    DXE  .22925317 02    DYE  .16798376 02    DZE  .72839797 01
    XT  .94252394 08     YT -.10928236 09     ZT -.47422644 08    DXT  .22387474 02    DYT  .17595658 02    DZT  .76807806 01
   LTE -.18216268 02    LOE  .31063153 03    LTT -.18191059 02    LOT  .31077667 03    RST  .15190475 09    VST  .29492381 02
   EPS  .82686187 02    ESP  .13525975 00    SEP  .97178373 02    EPM  .13564584 03    EMP  .42206273 02    MEP  .21478767 01
   MPS  .14165C25 03    MSP  .27453512-18    SMP  .38345021 02    SEM  .99325659 02    EMS  .80534176 02    ESM  .13988231 00
   RPM  .20188759 05    SPN  .81676316 02
   GCE  .10056409 03    GCT  .27904551 03    SIP  .13672023 03    CPT  .94608247 02    SIN  .89678228 02     D1  .25877409 01
   KEP  .36187954 06    VEP  .86482130 00    CPE  .98555113 02    CPS  .77074689 02     D2  .21359069 01     D3  .28218109 00
```

SELENOCENTRIC — EQUATORIAL COORDINATES

X	-.19631418 05	Y	.39932933 04	Z	.24994082 04	DX	.12370996 01	DY	-.31496175 00	DZ	-.23455468 00
R	.20188759 05	DEC	.71115775 01	RA	.16850214 03	V	.12979338 01	PTH	-.85702550 02	AZ	.14035951 03
R	.20188758 05	LAT	.34745189 01	LON	.31246288 03	VP	.12954452 01	PTP	-.87574463 02	AZP	.14372453 03
LTS	.93999368 00	LNS	.27416904 03	LTE	.59554058 01	LNE	.3547495C 03				
ALT	.18453760 05	SHA	-.12525015 05	ALP	.25111657 01	DR	-.12942846 01	DP	.27602270-03	ASD	.49300185 01
HGE	.27731381 03	SVL	-.94214690 00	HNG	.14166004 03	SIA	.13071582 03				

2 DAYS 0 HRS. 32 MIN. 2.000 SEC. 2356666336142020CC0000CC J.D.= 2438607.95833333 JULY 31,1964 11 00 00.000
TFL 2 DAYS 18 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.31171641 06	Y	.18394620 06	Z	.47340125 05	DX	.74492874 00	DY	.46596179 00	DZ	.15430571 00
R	.36502659 06	DEC	.74516526 01	RA	.30545172 02	V	.89210396 00	PTH	.87095210 02	AZ	.30160670 02
R	.36502659 06	LAT	.74516526 01	LON	.27644993 03	VE	.26385720 02	PTE	.19350540 01	AZE	.27008492 03
XS	-.94006147 08	YS	.10940010 09	ZS	.47440679 08	DXS	-.22912601 02	DYS	-.16813170 02	DZS	-.72904710 01
XM	.32680491 06	YM	.18110589 06	ZM	.45696444 05	DXM	-.54679479 00	DYM	.79234973 00	DZM	.39556265 00
XT	.32680491 06	YT	.18110589 06	ZT	.45696444 05	DXT	-.54679479 00	DYT	.79234973 00	DZT	.39556265 00
RS	.15184253 09	VS	.29339864 02	RM	.37641593 06	VM	.10408037 01	RT	.37641593 06	VT	.10408037 01
GED	.75018576 01	ALT	.35864874 06	LOS	.16576813 02	RAS	.13067206 03	RAM	.28993958 02	LOM	.27489871 03
DUT	.35000000 02	DT	.24000000 03	DR	.89095773 00	SHA	.36215914 06	DES	.18205939 02	DEM	.69728392 01

12 GOLDSTONE ECHO 1

R	.36502659 06	LAT	.74516526 01	LON	.27644993 03				
MIN	.29120333 04	HA	.32628659 03	DEC	.69632693 01	ELE	.48170467 02	AZI	.12429900 03
CKC	.25882586 03	CKM	.35686598 03	CKT	.35686598 03	PSS	.96922257 02	PSM	.16414838 01
UT	.48533888 02	DHA	.42262144-02	DDE	.11488713-04	DEL	.28642189-02	DAZ	.45959071-02
ET	.48524166 02	RGE	.36025395 06	DRG	.68134817 00	DDR	.00C0C000 00	SLS	.20322624 03
RDI	.63718803 04	PHI	.35117429 02	THI	.24319447 03	SPS	.82942835 02	PDL	.66479196 02
DT	.12016777 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.52181936 05	F1	.81181936 05	F2	.10436367 06	XA	.29668279 08	PRA	.31003121 02
D1	.27066645 04	D2	.34787957 04						

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.94317863 08	Y	-.10921615 09	Z	-.47393339 08	DX	.23657530 02	DY	.17279331 02	DZ	.74447767 01
R	.15188863 09	LAT	-.18181423 02	LON	.31081353 03	V	.30227119 02	PTH	-.10841388 00	AZ	.75012012 02
XE	.94006147 08	YE	-.10940010 09	ZE	-.47440679 08	DXE	.22912601 02	DYE	.16813370 02	DZE	.72904710 01
XT	.94332952 08	YT	-.10921899 09	ZT	-.47394983 08	DXT	.22365807 02	DYT	.17605720 02	DZT	.76860336 01
LTE	-.18205939 02	LOE	.31067206 03	LTT	-.18180598 02	LOT	.31C81732 03	RST	.15190055 09	VST	.29483313 02
EPS	.82677043 02	ESP	.13669873 00	SEP	.97186339 02	EPM	.13671471 03	EMP	.41673588 02	MEP	.16116766 01
MPS	.14055740 03	MSP	.18000000 03	SMP	.39438895 02	SEM	.98796700 02	EMS	.81062986 02	ESM	.14023158 00
RPM	.15441233 05	SPN	.81675881 02								
GCE	.10055749 03	GCT	.27804011 03	SIP	.13410594 03	CPT	.94937935 02	SIN	.88486471 02	D1	.33923769 01
REP	.36502659 06	VEP	.89210396 00	CPE	.98547217 02	CPS	.77078923 02	D2	.28034145 01	D3	.46635169 00

SELENOCENTRIC — EQUATORIAL COORDINATES

X	-.15088494 05	Y	.28403096 04	Z	.16436817 04	DX	.12517235 01	DY	-.32638795 00	DZ	-.24125693 00
R	.15441233 05	DEC	.61105740 01	RA	.16933920 03	V	.13539881 01	PTH	-.84579524 02	AZ	.14024601 03
R	.15441232 05	LAT	.28848661 01	LON	.31307580 03	VP	.13511252 01	PTP	-.86060847 02	AZP	.12854275 03
LTS	.94081245 00	LNS	.27366007 03	LTE	.59239690 01	LNE	.35477229 03				
ALT	.13706234 05	SHA	-.98091196 04	ALP	.16881799 01	DR	-.13479334 01	DP	.47459257-03	ASD	.64514636 01
HGE	.27732296 03	SVL	-.15989942 01	HNG	.14058454 03	SIA	.13C26324 03				

2 DAYS 1 HRS. 32 MIN. 2.000 SEC. 2356666354202020CC000000 J.D.= 2438608.00000000 JULY 31,1964 12 00 00.000
TFL 2 DAYS 19 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.31454879 06	Y	.18558380 06	Z	.47876684 05	DX	.84271149 00	DY	.44189794 00	DZ	.14311675 00
R	.36834015 06	DEC	.74684104 01	RA	.30540605 02	V	.96224676 00	PTH	.86958729 02	AZ	.29109747 03
R	.36834013 06	LAT	.74684113 01	LON	.26140428 03	VE	.26696859 02	PTE	.20626727 01	AZE	.27003947 03
XS	-.94088612 08	YS	.10933954 09	ZS	.47414421 08	DXS	-.22899874 02	DYS	-.16828357 02	DZS	-.72969592 01
XM	.32482C39 06	YM	.18394936 06	ZM	.47118183 05	DXM	-.55570463 00	DYM	.78733370 00	DZM	.39428435 00
XT	.32482039 06	YT	.18394936 06	ZT	.47118183 05	DXT	-.55570463 00	DYT	.78733370 00	DZT	.39428435 00
RS	.15184179 09	VS	.29340134 02	RM	.37625227 06	VM	.10412311 01	RT	.37625227 06	VT	.10412311 01
GED	.75187266 01	ALT	.36196230 06	LOS	.15762634 01	RAS	.13071258 03	RAM	.29523351 02	LOM	.26038703 03
DUT	.35000000 02	DT	.12000000 03	DR	.96089153 00	SHA	.36541571 06	DES	.18195601 02	DEM	.71940563 01

12 GOLDSTONE ECHO 1

R	.36834013 06	LAT	.74684113 01	LON	.26140428 03				
MIN	.29720333 04	HA	.34153115 03	DEC	.69962224 01	ELE	.57154603 02	AZI	.14456844 03
CKC	.25891497 03	CKM	.35513457 03	CKT	.35513457 03	PSS	.97141785 02	PSM	.10634426 01
UT	.49533888 02	DHA	.42436635-02	DDE	.64699572-05	DEL	.20180478-02	DAZ	.68166301-02
ET	.49524166 02	RGE	.36297067 06	DRG	.84097932 00	DDR	.00C0C000 00	SLS	.20329150 03
RDI	.63718803 04	PHI	.35117429 02	THI	.24319447 03	SPS	.82722355 02	PDL	.80875994 02
DT	.12107396 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.52693136 05	F1	.81693137 05	F2	.10538627 06	XA	.29668294 08	PRA	.30799636 02
D1	.27231045 04	D2	.35128757 04						

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.94403161 08	Y	-.10915396 09	Z	-.47366544 08	DX	.23742586 02	DY	.17270255 02	DZ	.74400759 01
R	.15188855 09	LAT	-.18170793 02	LON	.31085530 03	V	.30287403 02	PTH	.47924021-01	AZ	.75000121 02
XE	.94088612 08	YE	-.10933954 09	ZE	-.47414421 08	DXE	.22899874 02	DYE	.16828357 02	DZE	.72969592 01
XT	.94413433 08	YT	-.10915559 09	ZT	-.47367303 08	DXT	.22344170 02	DYT	.17615691 02	DZT	.76912436 01
LTE	-.18195601 02	LOE	.31071258 03	LTT	-.18170130 02	LOT	.31C85796 03	RST	.15189635 09	VST	.29474721 02
EPS	.82637423 02	ESP	.13776809 00	SEP	.97224730 02	EPM	.13882468 03	EMP	.40129741 02	MEP	.10455818 01
MPS	.13837396 03	MSP	.27453512-18	SMP	.41623426 02	SEM	.98267258 02	EMS	.81592292 02	ESM	.14057998 00
RPM	.10428445 05	SPN	.81645267 02								
GCE	.10054983 03	GCT	.27621960 03	SIP	.12879702 03	CPT	.95563421 02	SIN	.85986482 02	D1	.50617006 01
REP	.36834015 06	VEP	.96224676 00	CPE	.98530775 02	CPS	.77083170 02	D2	.41945607 01	D3	.96112213 00

SELENOCENTRIC — EQUATORIAL COORDINATES

X	-.10271598 05	Y	.16344474 04	Z	.75850058 03	DX	.13984161 01	DY	-.34543576 00	DZ	-.25116760 00
R	.10428445 05	DEC	.41710231 01	RA	.17095872 03	V	.14621828 01	PTH	-.82535581 02	AZ	.14027930 03
R	.10428444 05	LAT	.17449007 01	LON	.31477967 03	VP	.14591985 01	PTP	-.83490668 02	AZP	.12125590 03
LTS	.94163C36 00	LNS	.27315108 03	LTE	.58919166 01	LNE	.35479549 03				
ALT	.86934454 04	SHA	-.69269061 04	ALP	.26531601 00	DR	-.14497519 01	DP	.10436346-02	ASD	.95769393 01
HGE	.27736257 03	SVL	-.28748966 01	HNG	.13845527 03	SIA	.12924774 03				

2 DAYS 2 HRS. 32 MIN. 2.000 SEC. 2356666372242020000000C0 J.D.= 2438608.04166666 JULY 31,1964 13 00 00.000
TFL 2 DAYS 20 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.31802454 06	Y	.18710403 06	Z	.48370027 05	DX	.11756684 01	DY	.39761063 00	DZ	.13512082 00
R	.37213866 06	DEC	.74683516 01	RA	.30469661 02	V	.12484182 01	PTH	.78233179 02	AZ	.26460431 03
R	.37213865 06	LAT	.74683516 01	LON	.24629228 03	VE	.27167527 02	PTE	.25765317 01	AZE	.26994949 03
XS	-.94171030 08	YS	.10927893 09	ZS	.47388139 08	DXS	-.22887135 02	DYS	-.16843337 02	DZS	-.73034443 01
XM	.32280388 06	YM	.18677460 06	ZM	.48535247 05	DXM	-.56457207 00	DYM	.78223449 00	DZM	.39296592 00
XT	.32280388 06	YT	.18677460 06	ZT	.48535247 05	DXT	-.56457207 00	DYT	.78223449 00	DZT	.39296592 00
RS	.15184104 09	VS	.29340402 02	RM	.37608878 06	VM	.10416595 01	RT	.37608878 06	VT	.10416595 01
GED	.75186664 01	ALT	.36576081 06	LOS	.34657571 03	RAS	.13075309 03	RAM	.30053708 02	LOM	.24587633 03
DUT	.35000000 02	DT	.10854736 02	DR	.12221835 01	SHA	.36909682 06	DES	.18185254 02	DEM	.74148524 01

12 GOLDSTONE ECHO 1

R	.37213865 06	LAT	.74683516 01	LON	.24629228 03				
MIN	.30320333 04	HA	.35685783 03	DEC	.70059486 01	ELE	.61740454 02	AZI	.17340167 03
CKC	.25900946 03	CKM	.35036826 03	CKT	.35036826 03	PSS	.97445722 02	PSM	.42203066 00
UT	.50533888 02	DHA	.42779143-02	DDE	-.17994006-05	DEL	.40029474-03	DAZ	.89278186-02
ET	.50524165 02	RGE	.36651399 06	DRG	.12014642 01	DDR	.00000000 00	SLS	.20337588 03
RDI	.63718803 04	PHI	.35117429 02	THI	.24319447 03	SPS	.82417183 02	PDL	.10402602 03
DT	.12225589 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.53847546 05	F1	.82847545 05	F2	.10769509 06	XA	.29668330 08	PRA	.30514023 02
D1	.27615848 04	D2	.35898364 04						

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.94485054 08	Y	-.10909183 09	Z	-.47339769 08	DX	.24062803 02	DY	.17240948 02	DZ	.74385652 01
R	.15188898 09	LAT	-.18160111 02	LON	.31089722 03	V	.30522139 02	PTH	.50282998 00	AZ	.74967029 02
XE	.94171030 08	YE	-.10927893 09	ZE	-.47388139 08	DXE	.22887135 02	DYE	.16843337 02	DZE	.73034443 01
XT	.94493834 08	YT	-.10909216 09	ZT	-.47339604 08	DXT	.22322563 02	DYT	.17625572 02	DZT	.76964103 01
LTE	-.18185254 02	LOE	.31075309 03	LTT	-.18159655 02	LOT	.31089857 03	RST	.15189214 09	VST	.29465103 02
EPS	.82525993 02	ESP	.13918114 00	SEP	.97330771 02	EPM	.14528389 03	EMP	.34300203 02	MEP	.41590080 00
MPS	.13121363 03	MSP	.27453512-18	SMP	.48785004 02	SEM	.97737333 02	EMS	.82122089 02	ESM	.14075386 00
RPM	.47535317 04	SPN	.81547967 02								
GCE	.10053603 03	GCT	.27135880 03	SIP	.10999387 03	CPT	.97460684 02	SIN	.76240925 02	D1	.11648138 02
REP	.37213866 06	VEP	.12484182 01	CPE	.98491649 02	CPS	.77087439 02	D2	.98311903 01	D3	.39613607 01

SELENOCENTRIC — EQUATORIAL COORDINATES

X	-.47793437 04	Y	.32942742 03	Z	-.16521969 03	DX	.17402404 01	DY	-.38462386 00	DZ	-.25784509 00
R	.47935317 04	DEC	-.19752164 01	RA	.17605699 03	V	.18007933 01	PTH	-.76719526 02	AZ	.14033506 03
R	.47935314 04	LAT	-.18629597 01	LON	.32135295 03	VP	.17981944 01	PTP	-.77075002 02	AZP	.11764186 03
LTS	.94244913 00	LNS	.27264208 03	LTE	.58592504 01	LNE	.35481910 03				
ALT	.30585317 04	SHA	-.36058981 04	ALP	.29803619 01	DR	-.17526350 01	DP	.49445405-02	ASD	.21219759 02
HGE	.27747000 03	SVL	-.68907643 01	HNG	.13157978 03	SIA	.12406413 03				

2 DAYS 2 HRS. 57 MIN. 50.739 SEC. 2356666400272021364762C3 J.D.= 2438608.05959188 JULY 31,1964 13 25 48.739
TFL 2 DAYS 20 HRS. 35 MIN. 40.865 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.32029138 06	Y	.18771488 06	Z	.48627746 05	DX	.20228729 01	DY	.43327257 00	DZ	.28007673 00
R	.37441701 06	DEC	.74624230 01	RA	.30373514 02	V	.27876262 01	PTH	.71875530 02	AZ	.27199329 03
R	.37441701 06	LAT	.74624221 01	LON	.23972539 03	VE	.27791620 02	PTE	.40938292 01	AZE	.27004668 03
XS	-.94206472 08	YS	.10925284 09	ZS	.47376826 08	DXS	-.22881651 02	DYS	-.16849780 02	DZS	-.73062334 01
XM	.32192655 06	YM	.18798436 06	ZM	.49143401 05	DXM	-.56837358 00	DYM	.78001525 00	DZM	.39238638 00
XT	.32192655 06	YT	.18798436 06	ZT	.49143401 05	DXT	-.56837358 00	DYT	.78001525 00	DZT	.39238638 00
RS	.15184073 09	VS	.29340519 02	RM	.37601848 06	VM	.10418442 01	RT	.37601848 06	VT	.10418442 01
GED	.75126979 01	ALT	.36803916 06	LOS	.34012239 03	RAS	.13077052 03	RAM	.30282173 02	LOM	.23963405 03
DUT	.35000000 02	DT	.59999999 02	DR	.19840444 01	SHA	.37126505 06	DES	.18180800 02	DEM	.75097058 01

12 GOLDSTONE ECHO 1

R	.37441701 06	LAT	.74624221 01	LON	.23972539 03				
MIN	.30578456 04	HA	.35184440 01	DEC	.70027478 01	ELE	.61699814 02	AZI	.18738191 03
CKC	.25906551 03	CKM	.34174196 03	CKT	.34174196 03	PSS	.97641571 02	PSM	.10467832 00
UT	.50964093 02	DHA	.43387788-02	DDE	.55297955-05	DEL	-.45048363-03	DAZ	.90336193-02
ET	.50954371 02	RGE	.36879454 06	DRG	.20075042 01	DDR	.00000000 00	SLS	.20342976 03
RDI	.63718803 04	PHI	.35117429 02	THI	.24319447 03	SPS	.82220545 02	PDL	.11556770 03
DT	.12301660 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.56428794 05	F1	.85428794 05	F2	.11285759 06	XA	.29668410 08	PRA	.30324149 02
D1	.28476264 04	D2	.37619196 04						

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.94526763 08	Y	-.10906512 09	Z	-.47328199 08	DX	.24904524 02	DY	.17283052 02	DZ	.75863102 01
R	.15188966 09	LAT	-.18155434 02	LON	.31091548 03	V	.31248860 02	PTH	.13294212 01	AZ	.74741799 02
XE	.94206472 08	YE	-.10925284 09	ZE	-.47376826 08	DXE	.22881651 02	DYE	.16849780 02	DZE	.73062334 01
XT	.94528399 08	YT	-.10906486 09	ZT	-.47327683 08	DXT	.22313277 02	DYT	.17629795 02	DZT	.76986199 01
LTE	-.18188CBC0 02	LOE	.31077052 03	LTT	-.18155146 02	LOT	.31091604 03	RST	.15189032 09	VST	.29461173 02
EPS	.82420258 02	ESP	.14023158 00	SEP	.97439691 02	EPM	.15727524 03	EMP	.22622597 02	MEP	.10159538 00
MPS	.11247385 03	MSP	.27453512-18	SMP	.67525546 02	SEM	.97509209 02	EMS	.82350163 02	ESM	.14075386 00
RPM	.17355998 04	SPN	.81444207 02								
GCE	.10051380 03	GCT	.26267644 03	SIP	.23980274 02	CPT	.10155001 03	SIN	.13056440 02	D1	.11407646 04
REP	.37441701 06	VEP	.20876262 01	CPE	.98443452 02	CPS	.77085279 02	D2	.15031184 03	D3	.17945157 05

```
SELENOCENTRIC                                                                    EQUATORIAL COORDINATES

  X -.16351722 04     Y -.26947957 03     Z -.51565460 03     DX  .25912465 01     DY -.34674268 00     DZ -.11230964 00
  R  .17355998 04   DEC -.17283777 02    RA  .18935834 03      V  .26167542 01   PTH -.64109100 02     AZ  .13807292 03
  R  .17355996 04   LAT -.10699483 02   LON  .33933183 03     VP  .26149380 01   PTP -.64191189 02   AZP  .11488748 03
LTS  .9428C089 C0   LNS  .27242310 03   LTE  .58450094 01    LNE  .35482939 03
ALT  .59985352 00   SHA -.16037611 04   ALP  .51306506 01     DR -.23541032 01     DP  .37720568-01    ASD  .88493572 02
HGE  .27757974 03   SVL -.16442478 02   HNG  .11348826 03    SIA  .68781666 02

                                        SELENOCENTRIC CONIC

EPOCH OF PERICENTER PASSAGE                    2356666402462022344126O3 J.D.= 2438608.06621785  JULY 31,1964 13 35 21.223
  SMA -.40924676 04    ECC  .10936266 01      H  .18119015 04     SLR  .8C22C246 03     APO  .00000000 00     RCA  .38316405 03
   VH  .10545111 01     C3  .11979546 01     C1  .19831465 04     TFP -.57248458 03      TF  .51123117 02     LTF  .51030159 02
   TA -.11945593 03    MTA  .15611908 03     EA -.43490310 02      MA -.87724438 01     C3J -.21690825 01     TFI  .50964094 02
  ZAE  .13175635 03    ZAP  .14584316 03    ZAC  .93425564 02    CEF  .13223816 03      IR  .41486247 04      GP  .78477934 00
  UPL  .75797415 01     GY -.62902635 01    CP2 -.12813536 02

                                                        ALL VECTORS REFERENCED TO EARTH EQUATOR PLANE
  X -.16351722 04     Y -.26947957 03     Z -.51565460 03     DX  .25912465 01     DY -.34674268 00     DZ -.11230964 00
INC  .50356235 02   LAN  .35441816 03   APF  .32215162 03     MX  .32675507 00     MY -.62334739 00     MZ -.71040072 00
 WX -.74898298-01    WY -.76637494 00    WZ  .63801233 00     PX  .74781624 00     PY -.46641723 00     PZ -.47246783 00
 QX  .65966742 00    QY  .44172894 00    QZ  .60804146 00     RX -.17986090 00     RY  .46846459-01     RZ -.98257592 00
 BX -.30044882 00    BY -.59273500 00    BZ -.74725881 00     TX -.25205021 00     TY -.96771416 00     TZ  .00000000 00
SXI  .95085264 00   SYI -.24765847 00   SZI -.18586159 00    CAI -.1C711370 02    RAI  .34540113 03
SXO -.41673701 00   SYO  .60531496 00   SZO  .67817702 00    CAO  .42701352 02    RAO  .12454597 03
ETE  .20C31438 03   ETS  .16619747 02   ETC  .30470557 03
BTO  .11765152 04   BRO  .13779691 04     B  .18119015 04    THA  .49509174 02

                                                        ALL VECTORS REFERENCED TO ECLIPTIC PLANE
  X -.16351722 04     Y -.45238741 03     Z -.36587501 03     DX  .25912465 01     DY -.36280162 00     DZ  .34913115-01
INC  .27C95681 02   LAN  .35C53533 03   APF  .32702539 03     MX  .27177C75C 00    MY -.86098703 00     MZ -.41165178 00
 WX -.7489B301-01    WY -.44927767 00    WZ  .89024714 00     PX  .74781628 00     PY -.61588608 00     PZ -.24790161 00
 QX  .65966736 00    QY  .64717386 00    QZ  .38210596 00     RX -.68627857-01     RY  .21736201-01     RZ -.99740551 00
 BX -.30044872 00    BY -.84110205 00    BZ -.44975318 00     TX -.30194279 00     TY -.95332605 00     TZ  .00000000 00
SXI  .95085265 00   SYI -.30115940 00   SZI -.71987814-01    CAI -.412A1688 01    RAI  .34242567 03
SXO -.41673707 00   SYO  .82515932 00   SZO  .38136912 00    CAO  .22418514 02    RAO  .11679552 03
ETE  .1776C812 03   ETS  .35391349 03   ETC  .28199932 03
BTO  .16172358 04   BRO  .81702817 03     B  .18119014 04    THA  .26802922 02

                                                        ALL VECTORS REFERENCED TO ORBIT PLANE OF TARGET
  X  .15284076 04     Y  .64239198 03     Z -.51342926 03     DX -.26025276 01     DY  .46397037-01     DZ  .26851469 00
INC  .285C4040 02   LAN  .16802809 03   APF  .33776371 03     MX -.22553950-02     MY -.79852344 00     MZ  .42445798 00
 WX  .9899C806-01    WY  .46684088 0C    WZ  .87878346 00     PX -.83651567 0C     PY  .51732739 00     PZ -.18059309 00
 QX -.53892703 00    QY -.71723904 00    QZ  .44173036 00     RX -.13466C3C-01     RY  .25022278-02     RZ -.99990619 00
 BX  .15413629 00    BY  .86526874 00    BZ -.47702412 00     TX  .18269055 00     TY  .98317047 00     TZ  .00000000 00
SXI -.98307823 00   SYI  .18267341 0C   SZI  .13696536-01    CAI  .78477763 00    RAI  .16947348 03
SXO  .54672293 00   SYO -.7634C336 00   SZO  .34396114 00    CAO  .2C118392 02    RAO  .30560892 03
ETE  .1632C990 03   ETS  .32510480 03   ETC  .26136655 03
BTO  .15924186 04   BRO  .86440184 03     B  .18119016 04    THA  .28494137 02

                                                        ALL VECTORS REFERENCED TO TRUE LUNAR EQU. PLANE
  X  .15956646 04     Y -.60193858 03     Z -.32222753 03     DX -.18813942 01     DY  .18184112 01     DZ -.33721554-01
INC  .26866409 02   LAN  .13743304 03   APF  .32371275 03     MX  .34622437-01     MY -.74962109 00     MZ  .26610459 00
 WX  .30569629 00    WY  .33282734 00    WZ  .89206262 00     PX -.23651893 00     PY  .93409085 00     PZ -.26745658 00
 QX -.92228443 00    QY -.12922922 00    QZ  .36426809 00     RX  .5752C540-01     RY -.76217073-01     RZ -.99527555 00
 BX  .74757522 00    BY  .49632001 00    BZ -.44135897 00     TX  .8C561176 0C     TY  .59244385 00     TZ  .00000000 00
SXI -.58964487 00   SYI  .80180568 0C   SZI -.97090282-01    CAI -.55716413 01    RAI  .12633062 03
SXO -.15710425 00   SYO -.90643914 00   SZO  .39202844 00    CAO  .23C8C774 02    RAO  .26016716 03
ETE  .1125C303 00   ETS  .18146914 03   ETC  .25513309 03
BTT  .1624C034 04   BRT  .80349565 03     B  .18119030 04    THA  .26324469 02
22246232546?   220750470436   215753222205   201560037435   200757472064   177435677052
                  640702910                  2758000                       000000000000

                                                        RA-7 POST M1

                TIME ON   11080       TIME OFF   11090

                                    MONITOR CONTROL WORDS

 TRAJ      SAVE
```

SPACE TRAJECTORY
RA-7 PREMIDCOURSE ORBIT

GME	.3986C164 06	J	.16234500-02	H	-.57499999-05	D	.78749999-05	RE	.63781650 04	REM	.63783251 04
G	.66705998-19	A	.88782497 29	B	.88800499 29	C	.88837498 29	LME	.41780741-02	AU	.14959900 09
GMM	.49027757 04	GMS	.13271544 12	GMV	.32476950 06	GMA	.42977799 05	GMC	.37918700 08	GMJ	.12671060 09
EGM	.3986C320 06	MGM	.49027779 04	JA	.29200000-02	HA	.00000000 00	DA	.00000000 00	RA	.34170000 04
ARA	.3567C000 01	GB	.40008370 00	MAS	.37410000 03	GR1	.00000000 00	GB2	.00000000 00	SC	.10200000 09

INJECTION CONDITIONS MOON 2356664502572020000000000 J.D.= 2438605.22217592 JULY 28,1964 17 19 56.000

GEOCENTRIC XO-.48335854 04 YO-.42062292 04 ZO-.14412357 04 DXO .70599431 01 DYO-.68710423 01 DZO-.47803715 01
CARTESIAN GMC .00000000 00 SGC .00000000 00 TO .62396000 05 GHA .20638174 03 GHO .30568664 03

0 DAYS 0 HRS. 0 MIN. C.000 SEC. 2356664502572020C0000000 J.D.= 2438605.22217592 JULY 28,1964 17 19 56.000
TFL 0 DAYS 0 HRS. 29 MIN. 48.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	-.48335851 04	Y	-.42062289 04	Z	-.14412356 04	DX	.70599428 01	DY	-.68710420 01	DZ	-.47803713 01
R	.65675769 04	DEC	-.12676559 02	RA	.22103008 03	V	.10950158 02	PTH	.13274131 01	AZ	.11625536 03
R	.65675768 04	LAT	-.12676559 02	LON	.14648345 02	VE	.10533266 02	PTE	.13799603 01	AZE	.11738007 03
XS	-.88492690 08	YS	.11325740 09	ZS	.49113300 08	DXS	-.23722515 02	DYS	-.15814255 02	DZS	-.68579680 01
XM	.38246674 06	YM	-.30199025 05	ZM	-.50845791 05	DXM	.82773832-01	DYM	.93299147 00	DZM	.39361410 00
XT	.38246674 06	YT	-.30199025 05	ZT	-.50845791 05	DXT	.82773832-01	DYT	.93299147 00	DZT	.39361410 00
RS	.15188914 09	VS	.29323712 02	RM	.38701174 06	VM	.10160003 01	RT	.38701174 06	VT	.10160003 01
GED	-.12760128 02	ALT	.19041022 03	LOS	.28162025 03	RAS	.12800198 03	RAM	.35548537 03	LOM	.14910364 03
OUT	.35000000 02	DT	.15000000 02	DR	.25366782 00	SHA	.65203349 04	DES	.18865618 02	DEM	-.75493738 01

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R	.65675768 04	LAT	-.12676559 02	LON	.14648345 02				
MIN	.00000000 00	HA	.70939258 02	DEC	.40958317 02	ELE	-.35845208 01	AZI	.31434195 03
CKC	.26548731 02	CKM	.12865017 03	CKT	.12865017 03	PSS	.37210180 02	PSM	.14417830 03
UT	.00000000 00	DHA	-.16027527 00	CDE	.52803352-01	DEL	.75699247-01	DAZ	.10841538 00
ET	-.97222220-02	RGE	.20251044 04	DRG	-.94427145 01	DDR	.89549939-02	SLS	.15822302 03
RDI	.63754553 04	PHI	-.25739277 02	THI	.27686085 02	SPS	.14278935 03	POL	.57244511 02
DT	.67550202-02	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.1976C825 05	F1	.48760825 05	F2	.39521649 05	XA	.29667277 08	PRA	.16312856 03
D1	.16253608 04	D2	.13173883 04	DUP	.57351629 02	DF1	.28677308 02	DF2	.57354616 02

GEOCENTRIC CONIC

EPOCH OF PERICENTER PASSAGE 2356664502472027600240000 J.D.= 2438605.22185040 JULY 28,1964 17 19 27.875

SMA	.26955698 06	ECC	.97564889 00	B	.59124138 05	SLR	.12968176 05	APO	.53254995 06	RCA	.65640084 04
VH	.1350C462 00	C3	-.14787287 01	C1	.71896705 05	TFP	.28124695 02	TF	-.78124151-02	PER	.23213197 05
TA	.26879675 01	MTA	.00000000 00	EA	.29847285 00	MA	.72694926-02	C3J	-.18712406 01	TFI	.00000000 00

ALL VECTORS REFERENCED TO EARTH EQUATOR PLANE

X	-.48335851 04	Y	-.42062289 04	Z	-.14412356 04	DX	.70599428 01	DY	-.68710420 01	DZ	-.47803713 01
INC	.28958505 02	LAN	.17046288 02	APF	.20426365 03	MX	.66196137 00	MY	-.61281127 00	MZ	-.43158947 00
WX	.14193342 00	WY	-.46290539 00	WZ	.87497057 00	PX	-.76621094 00	PY	-.61101024 00	PZ	-.19896554 00
QX	.62671820 00	QY	-.64217215 00	QZ	-.44140594 00	RX	.15555976 00	RY	.12405018 00	RZ	-.98000647 00
BX	-.62671821 00	BY	.64217216 00	BZ	.44140595 00	TX	-.62347571 00	TY	.78184272 00	TZ	.00000000 00
DAP	-.11476474 02	RAP	.21857039 03								
HTQ	.52787285 05	BRQ	-.26630177 05	B	.59124138 05	THA	.33322993 03				

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.88487856 08	Y	-.11326160 09	Z	-.49114741 08	DX	.30782458 02	DY	.89432126 01	DZ	.20775966 01
R	.15188993 09	LAT	-.18866090 02	LON	.30799943 03	V	.32122533 02	PTH	.19253983 02	AZ	.78944614 02
XE	.88492690 08	YE	-.11325740 09	ZE	-.49113300 08	DXE	.23722515 02	DYE	.15814255 02	DZE	.68579680 01
XT	.88875156 08	YT	-.11328760 09	ZT	-.49164145 08	DXT	.23805289 02	DYT	.16747246 02	DZT	.72515820 01
LTE	-.18865618 02	LOE	.30800198 03	LTT	-.18852131 02	LOT	.30811451 03	AST	.15215119 09	VST	.29995790 02
EPS	.83121160 02	ESP	.27453512-18	SEP	.96876378 02	EPM	.48837329 02	EMP	.73205182 00	MEP	.13043065 03
MPS	.13183429 03	MSP	.11014343 00	SMP	.48055914 02	SEM	.13256592 03	EMS	.47326739 02	ESM	.10698938 00
RPM	.3913C292 06	SPN	.69211292 01								
GCE	.27825672 03	GCT	.28210143 03	SIP	.13158025 03	CPT	.90C11764 02	SIN	.89757717 02	D1	.13301846 00
REP	.65675769 04	VEP	.10950158 02	CPE	.80396902 02	CPS	.76802219 02	D2	.89203522-01	D3	.53001433-03

0 DAYS 0 HRS. 0 MIN. 5.000 SEC. 2356664502602022000000000 J.D.= 2438605.22223379 JULY 28,1964 17 20 01.000
TFL 0 DAYS 0 HRS. 29 MIN. 53.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	-.47982004 04	Y	-.42405099 04	Z	-.14651119 04	DX	.70938538 01	DY	-.68413029 01	DZ	-.47701074 01
R	.65685576 04	DEC	-.12887395 02	RA	.22146931 03	V	.10948977 02	PTH	.15628651 01	AZ	.11615804 03
R	.65685575 04	LAT	-.12887395 02	LON	.15066683 02	VE	.10532026 02	PTE	.16247534 01	AZE	.11727843 03
XS	-.88492808 08	YS	.11325732 09	ZS	.49113265 08	DXS	-.23722498 02	DYS	-.15814276 02	DZS	-.68579772 01
XM	.38246715 06	YM	-.30194360 05	ZM	-.50843823 05	DXM	.82760535-01	DYM	.93299242 00	DZM	.39361583 00
XT	.38246715 06	YT	-.30194360 05	ZT	-.50843823 05	DXT	.82760535-01	DYT	.93299242 00	DZT	.39361583 00
RS	.15188914 09	VS	.29323712 02	RM	.38701152 06	VM	.10160008 01	RT	.38701152 06	VT	.10160008 01
GED	-.12972259 02	ALT	.19182513 03	LOS	.28159941 03	RAS	.12800204 03	RAM	.35548607 03	LOM	.14908344 03
OUT	.35000000 02	DT	.50000000 01	DR	.29861984 00	SHA	.65150017 04	DES	.18865604 02	DEM	-.75490844 01

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R	.65685575 04	LAT	-.12887395 02	LON	.15066683 02				
MIN	.83333332-01	HA	.70118503 02	DEC	.41227260 02	ELE	-.31996286 01	AZI	.31489683 03
CKC	.26598319 02	CKM	.12869821 03	CKT	.12869821 03	PSS	.37898449 02	PSM	.14416388 03
UT	.13888889-02	DHA	-.16813395 00	CDE	.54783876-01	DEL	.78286180-01	DAZ	.11359270 00
ET	-.83333331-02	RGE	.19780058 04	DRG	-.93962105 01	DDR	.96562821-02	SLS	.15801862 03
RDI	.63754553 04	PHI	-.25739277 02	THI	.27686085 02	SPS	.14210109 03	POL	.57158653 02
DT	.65575163-02	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.19909748 05	F1	.48909748 05	F2	.39819456 05	XA	.29667281 08	PRA	.16397022 03
D1	.16303249 04	D2	.13273165 04	DUP	.61842979 02	DF1	.30923100 02	DF2	.61846200 02

GEOCENTRIC CONIC

EPOCH OF PERICENTER PASSAGE 2356664502472027607011 20 J.D.= 2438605.22185048 JULY 28,1964 17 19 27.882

SMA	.26949593 06	ECC	.97564337 00	B	.59117360 05	SLR	.12968143 05	APO	.53242785 06	RCA	.65640100 04
VH	.13503541 00	C3	-.14790636 01	C1	.71896613 05	TFP	.33118146 02	TF	-.78105961-02	PER	.23205311 05
TA	.31647582 01	MTA	.00000000 00	EA	.35148067 00	MA	.85630774-02	C3J	-.18715458 01	TFI	.13888889-02

ALL VECTORS REFERENCED TO EARTH EQUATOR PLANE

X	-.47982004 04	Y	-.42405099 04	Z	-.14651119 04	DX	.70938538 01	DY	-.68413029 01	DZ	-.47701074 01
INC	.28958377 02	LAN	.17046154 02	APF	.20426440 03	MX	.66807127 00	MY	-.60745459 00	MZ	-.42974377 00
WX	.14193177 00	WY	-.46290388 00	WZ	.87497166 00	PX	-.76620404 00	PY	-.61101722 00	PZ	-.19897050 00
QX	.62672697 00	QY	-.64216658 00	QZ	-.44140157 00	RX	.15556240 00	RY	.12405482 00	RZ	-.98000544 00
BX	-.62672698 00	BY	.64216660 00	BZ	.44140158 00	TX	-.62348349 00	TY	.78183652 00	TZ	.00000000 00
DAP	-.11476763 02	RAP	.21857096 03								
BTQ	.52781352 05	BRQ	-.26626887 05	B	.59117360 05	THA	.33323018 03				

HELICCENTRIC EQUATORIAL COORDINATES

X	.8848EC09 08	Y	-.11326156 09	Z	-.49114731 08	DX	.30816352 02	DY	.89729729 01	DZ	.20878698 01
R	.15188998 09	LAT	-.18866079 02	LON	.30799949 03	V	.32163970 02	PTH	.19217379 02	AZ	.78944433 02
XE	.8849280B 08	YE	-.11325732 09	ZE	-.49113265 08	DXE	.23722498 02	DYE	.15814276 02	DZE	.68579772 01
XT	.88875275 08	YT	-.11328751 09	ZT	-.49164109 08	DXT	.23805259 02	DYT	.16747268 02	DZT	.72515929 01
LTE	-.18865604 02	LOE	.30800204 03	LTT	-.18852117 02	LOT	.30811457 03	RST	.15215119 09	VST	.29995782 02
EPS	.82648915 02	ESP	.27453512-18	SEP	.97348624 02	EPM	.49307074 02	EMP	.73734523 00	MEP	.12995553 03
MPS	.13182830 03	MSP	.11014343 00	SMP	.48061908 02	SEM	.13256523 03	EMS	.47327432 02	ESM	.10698938 00
RPM	.39126246 06	SPN	.64978275 01								
GCE	.27822645 03	GCT	.28209989 03	SIP	.13157423 03	CPT	.90011021 02	SIN	.89756949 02	D1	.13303222 00
RLP	.65685576 04	VEP	.10948977 02	CPE	.80364821 02	CPS	.76802228 02	D2	.89202422-01	D3	.53001244-03

0 DAYS 0 HRS. 40 MIN. 4.000 SEC. 2356664514102020000000000 J.D.= 2438605.25000000 JULY 28,1964 18 00 00.000
TFL 0 DAYS 1 HRS. 9 MIN. 52.127 SEC.

GECCENTRIC EQUATORIAL COORDINATES

X	.14133803 05	Y	-.79893450 04	Z	-.65085510 04	DX	.65613633 01	DY	.74194698 00	DZ	-.66675857 00
R	.17491577 05	DEC	-.21844960 02	RA	.33052204 03	V	.66367567 01	PTH	.51736944 02	AZ	.70518762 02
R	.17491577 05	LAT	-.21844960 02	LON	.11409622 03	VE	.60227585 01	PTE	.59908026 02	AZE	.63005792 02
XS	-.88549711 08	YS	.11321937 09	ZS	.49096807 08	DXS	-.23714533 02	DYS	-.15824559 02	DZS	-.68624289 01
XM	.38265805 06	YM	-.27955578 05	ZM	-.49898546 05	DXM	.76376092-01	DYM	.93342786 00	DZM	.39443895 00
XT	.38265805 06	YT	-.27955578 05	ZT	-.49898546 05	DXT	.76376092-01	DYT	.93342786 00	DZT	.39443895 00
RS	.15188869 09	VS	.29323858 02	RM	.38690897 06	VM	.10162199 01	RT	.38690897 06	VT	.10162199 01
GED	-.21979688 02	ALT	.11116360 05	LCS	.27160339 03	RAS	.12802923 03	RAM	.35582160 03	LOM	.13939578 03
DUT	.35000000 02	DT	.12000000 03	DR	.52110211 01	SHA	.63479236 04	DES	.18859101 02	DEM	-.74099125 01

41 WOOMERA

R	.17491577 05	LAT	-.21844960 02	LON	.11409622 03		
MIN	.40066667 02	HA	.33457545 02	DEC	-.15697802 02	ELE	.55804826 02	AZI	.28919893 03
CKC	.26442099 03	CKM	.61600378 01	CKT	.61600378 01	PSS	.16827697 03	PSM	.36286316 02
UT	.66777778 00	DHA	-.18250531-01	CDE	.31188423-02	DEL	.13043490-01	DAZ	.21667747-01
ET	.65805555 00	RGE	.11850047 05	DRG	.47594957 01	DDR	.46596188-03	SLS	.17356847 03
RDI	.63725840 04	PHI	-.31212509 02	THI	.13688834 03	SPS	.11722120 02	PUL	.23031894 03
DT	.39527495-01	RFR	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.65241721 05	F1	.94241720 05	F2	.13048344 06	XA	.29668682 08	PRA	.31985662 03
D1	.31413907 04	D2	.43494480 04	DUP	.2984220 01	DF1	.14921878 01	DF2	.29843755 01

51 JOBURG 85 FT.

R	.17491577 05	LAT	-.21844960 02	LON	.11409622 03		
MIN	.40066667 02	HA	.25373908 03	DEC	-.17493106 02	ELE	-.87609989 01	AZI	.10849874 03
CKC	.25308204 03	CKM	.35482109 03	CKT	.35482109 03	PSS	.13883181 03	PSM	.82689753 01
UT	.66777778 00	DHA	-.24278490-02	CDE	.2103150-02	DEL	-.3C923165-02	DAZ	-.70059004-03
ET	.65805555 00	RGE	.17288289 05	DRG	.59463732 01	DDR	-.98146047-03	SLS	.17684911 03
RDI	.63754553 04	PHI	-.25739277 02	THI	.27686085 02	SPS	.41163894 02	PUL	.34549299 03
DT	.57667517-01	RFR	.96004999 09	RF1	.96004999 09	RF2	.29668712 08	FA	.96004999 09
BF1	.69042555 05	F1	.98042555 05	F2	.13808511 06	XA	.29668800 08	PRA	.35037282 03
D1	.32680852 04	D2	.46028370 04	DUP	-.62856946 01	DF1	-.31430110 01	DF2	-.62860221 01

HELICCENTRIC EQUATORIAL COORDINATES

X	.88563844 08	Y	-.11322736 09	Z	-.49103316 08	DX	.30275896 02	DY	.16566506 02	DZ	.61956704 01
R	.15190498 09	LAT	-.18859597 02	LON	.30803170 03	V	.35063732 02	PTH	.54009251 01	AZ	.77299792 02
XE	.88549711 08	YE	-.11321937 09	ZE	-.49096807 08	DXE	.23714533 02	DYE	.15824559 02	DZE	.68624289 01
XT	.88932369 08	YT	-.11324732 09	ZT	-.49146706 08	DXT	.23790908 02	DYT	.16757987 02	DZT	.72568679 01
LTE	-.18859101 02	LOE	.30802923 03	LTT	-.18845473 02	LOT	.30814231 03	RST	.15214901 09	VST	.29991658 02
EPS	.21276813 02	ESP	.27453512-18	SEP	.15872079 03	EPM	.15037980 03	EMP	.12803698 01	MEP	.28339859 02
MPS	.13095385 03	MSP	.10560881 00	SMP	.48900518 02	SEM	.13223181 03	EMS	.47660311 02	ESM	.10767302 00
RPM	.37160659 06	SPN	-.10816407 00								
GCE	.12131714 03	GCT	.28173904 03	SIP	.13072634 03	CPT	.90012244 02	SIN	.89744733 02	D1	.14006901 00
REP	.17491577 05	VEP	.66367567 01	CPE	.88335142 02	CPS	.76806234 02	D2	.92401040-01	D3	.57049058-03

0 DAYS 1 HRS. 40 MIN. 4.000 SEC. 2356664542142020CC000000 J.D.= 2438605.29166666 JULY 28,1964 19 00 00.000
TFL 0 DAYS 2 HRS. 9 MIN. 52.127 SEC.

GECCENTRIC EQUATORIAL COORDINATES

X	.33222059 05	Y	-.36133339 04	Z	-.72746099 04	DX	.44486384 01	DY	.14096984 01	DZ	.27772747-01
R	.34200604 05	DEC	-.12280869 02	RA	.35379273 03	V	.46667338 01	PTH	.63228607 02	AZ	.63576598 02
R	.34200604 05	LAT	-.12280869 02	LON	.12232584 03	VE	.43C60657 01	PTE	.75373168 02	AZE	.32934415 03
XS	-.88635067 08	YS	.11316237 09	ZS	.49072091 08	DXS	-.23702569 02	DYS	-.15839986 02	DZS	-.68691069 01
XM	.38291573 06	YM	-.24594149 05	ZM	-.48476378 05	DXM	.66779712-01	DYM	.93401205 00	DZM	.39564583 00
XT	.38291573 06	YT	-.24594149 05	ZT	-.48476378 05	DXT	.66779712-01	DYT	.93401205 00	DZT	.39564583 00
RS	.15188801 09	VS	.29324078 02	RM	.38675481 06	VM	.10165499 01	RT	.38675481 06	VT	.10165499 01
GED	-.12361995 02	ALT	.27823374 05	LCS	.25660313 03	RAS	.12807002 03	RAM	.35632502 03	LOM	.12485812 03
DUT	.35000000 02	DT	.24000000 03	DR	.41665106 01	SHA	.23935165 05	DES	.18849337 02	DEM	-.72004707 01

41 WOOMERA

R	.34200604 05	LAT	-.12280869 02	LON	.12232584 03		
MIN	.10006667 03	HA	.17350212 02	DEC	-.80245962 01	ELE	.61725149 02	AZI	.32143733 03
CKC	.25918113 03	CKM	.79342294 00	CKT	.79342294 00	PSS	.13698714 03	PSM	.52476802 01
UT	.16677778 01	DHA	.70377958-03	CDE	.12618261-02	DEL	-.14385306-02	DAZ	.19447843-03
ET	.16580555 01	RGI	.28454879 05	DRG	.42461409 01	DDR	-.19567559-03	SLS	.18117720 03
RDI	.63725840 04	PHI	-.31212509 02	THI	.13688834 03	SPS	.43C05542 02	PUL	.25652367 03
DT	.94915247-01	RFR	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.63597763 05	F1	.92537762 05	F2	.12719553 06	XA	.29668631 08	PRA	.35100502 03
D1	.30865921 04	D2	.42398508 04	DUP	-.12531906 01	DF1	-.62662792 00	DF2	-.12532558 01

51 JOBURG 85 FT.

R	.34200604 05	LAT	-.12280869 02	LON	.12232584 03		
MIN	.10006667 03	HA	.25577132 03	DEC	-.74704527 01	ELE	-.93847387 01	AZI	.10306023 03
CKC	.25472970 03	CKM	.35634199 03	CKT	.35634199 03	PSS	.12516983 03	PSM	.61980061 01
UT	.16677778 01	DHA	.20975666-02	CDE	.9306932I-03	DEL	.14072323-02	DAZ	-.18163200-02
ET	.16580555 01	RGE	.34656794 05	DRG	.40795501 01	DDR	-.2883474E-03	SLS	.18288384 03
RDI	.63754553 04	PHI	-.25739277 02	THI	.27686085 02	SPS	.54819489 02	PUL	.35008244 03
DT	.11560260 00	RFR	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.63064276 05	F1	.92064276 05	F2	.12612855 06	XA	.29668615 08	PRA	.33816522 01
D1	.30688C92 04	D2	.42042850 04	DUP	-.18467010 01	DF1	-.92339861 00	DF2	-.18467472 01

HELICCENTRIC — EQUATORIAL COORDINATES

X	.88668269 08	Y	-.11316598 09	Z	-.49079365 08	DX	.28151207 02	DY	.17249684 02	DZ	.68968797 01
R	.15191244 09	LAT	-.18849091 02	LON	.30807956 03	V	.33728459 02	PTH	.22991176 01	AZ	.76705876 02
XE	.88635067 08	YE	-.11316237 09	ZE	-.49072091 08	DXE	.23702569 02	DYE	.15839986 02	DZE	.68691069 01
XT	.89C17982 08	YT	-.11318696 09	ZT	-.49120567 08	DXT	.23769348 02	DYT	.16773998 02	DZT	.72647527 01
LTE	-.18849337 02	LOE	.30807003 03	LTT	-.18835495 02	LOT	.30818393 03	RST	.15214572 09	VST	.29985422 02
EPS	.44405641 02	ESP	.98911702-02	SEP	.13558533 03	EPM	.17379217 03	EMP	.54786935 00	MEP	.56599294 01
MPS	.13135257 03	MSP	.99650790-01	SMP	.48547715 02	SEM	.13173113 03	EMS	.48160176 02	ESM	.10880789 00
RPM	.35273707 06	SPN	.33657746 02								
GCE	.10786492 03	GCT	.28161228 03	SIP	.13107074 03	CPT	.9C207890 02	SIN	.89926068 02	D1	.14756212 00
REP	.3420C604 05	VEP	.46667338 01	CPE	.92636631 02	CPS	.76811383 02	D2	.98045821-01	D3	.64107390-03

0 DAYS 2 HRS. 40 MIN. 4.000 SEC. 2356664550202020000000000 J.D.= 2438605.33333333 JULY 28,1964 20 00 00.000
TFL 0 DAYS 3 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.47538252 05	Y	.15606775 04	Z	-.68479159 04	DX	.35582806 01	DY	.14414255 01	DZ	.18184411 00
R	.48054293 05	DEC	-.81927538 01	RA	.18803429 01	V	.38805152 01	PTH	.67323611 02	AZ	.62135555 02
R	.48054292 05	LAT	-.81927538 01	LON	.11537238 03	VE	.42324651 01	PTE	.57776046 02	AZE	.28804824 03
XS	-.8872C372 08	YS	.11310532 09	ZS	.49047352 08	DXS	-.23690595 02	DYS	-.15855405 02	DZS	-.68757819 01
XM	.38313884 06	YM	-.21230783 05	ZM	-.47049935 05	DXM	.57165242-01	DYM	.93451291 00	DZM	.39681859 00
XT	.38313884 06	YT	-.21230783 05	ZT	-.47049935 05	DXT	.57165242-01	DYT	.93451291 00	DZT	.39681859 00
RS	.15188732 09	VS	.29324299 02	RM	.38660033 06	VM	.10168811 01	RT	.38660033 06	VT	.10168811 01
GED	-.82478200 01	ALT	.41676525 05	LOS	.24160285 03	RAS	.12811081 03	RAM	.35682832 03	LOM	.11032037 03
DUT	.35CCCCCC 02	DT	.48000000 03	DR	.35805400 01	SHA	.38454987 05	DES	.18839563 02	DEM	-.69903263 01

41 WOOMERA

R	.48054292 05	LAT	-.81927538 01	LON	.11537238 03		
MIN	.16C06666 03	HA	.24209170 02	DEC	-.47643310 01	ELE	.55123043 02
CKC	.2596C530 03	CKM	.11701915 01	CKT	.11701915 01	PSS	.12827352 03
UT	.26677777 01	DHA	.26563330-02	DDE	.66021114-03	DEL	-.21450320-02
ET	.2658C555 01	RGE	.42687980 05	DRG	.37124159 01	DDR	-.11C19744-03
RDI	.63725840 04	PHI	-.31212509 02	THI	.13688834 03	SPS	.51713833 02
DT	.14239175 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08
BF1	.61888572 05	F1	.90888572 05	F2	.12377714 06	XA	.29668579 08
D1	.30296190 04	D2	.41259048 04	DOP	-.70575178 00	DF1	-.35289427 00

AZI	.31438491 03		
PSM	.32691123 01		
DAZ	-.29482645-02		
SLS	.18470018 03		
POL	.25247427 03		
FA	.96004999 09		
PRA	.35918712 03		
DF2	-.70578853 00		

51 JOBURG 85 FT.

R	.48054292 05	LAT	-.81927538 01	LON	.11537238 03		
MIN	.16C06666 03	HA	.2654C130 03	DEC	-.48901089 01	ELE	-.2CC22315 01
CKC	.2556C445 03	CKM	.35716934 03	CKT	.35716934 03	PSS	.11529106 03
UT	.26677777 01	DHA	.30868908-02	DDE	.55976766-03	DEL	.25174493-02
ET	.2658C555 01	RGE	.47852762 05	DRG	.33311731 01	DDR	-.15172638-03
RDI	.63754553 04	PHI	-.25739277 02	THI	.27686085 02	SPS	.60693201 02
DT	.15961961 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08
BF1	.60667687 05	F1	.89667687 05	F2	.12133537 06	XA	.29668541 08
D1	.29885229 04	D2	.40445125 04	DOP	-.97172094 00	DF1	-.48588578 00

AZI	.96404498 02		
PSM	.11186672 02		
DAZ	-.18546264-02		
SLS	.18569221 03		
POL	.35283447 03		
FA	.96004999 09		
PRA	.87927432 01		
DF2	-.97177155 00		

HELICCENTRIC — EQUATORIAL COORDINATES

X	.88767910 08	Y	-.11310376 09	Z	-.49054199 08	DX	.27288875 02	DY	.17296830 02	DZ	.70576259 01
R	.15191615 09	LAT	-.18838584 02	LON	.30812610 03	V	.33070729 02	PTH	.13667695 01	AZ	.76485380 02
XE	.8872C372 08	YE	-.11310532 09	ZE	-.49047352 08	DXE	.23690595 02	DYE	.15855405 02	DZE	.68757819 01
XT	.891C3510 08	YT	-.11312655 09	ZT	-.49094402 08	DXT	.23747760 02	DYT	.16789917 02	DZT	.72726005 01
LTE	-.18839563 02	LOE	.30811081 03	LTT	-.18825510 02	LOT	.30822554 03	RST	.15214240 09	VST	.29979128 02
EPS	.53138559 02	ESP	.98911702-02	SEP	.12684693 03	EPM	.17412050 03	EMP	.72954159 00	MEP	.51499379 01
MPS	.13185654 03	MSP	.94614623-01	SMP	.48048433 02	SEM	.13123005 03	EMS	.48660452 02	ESM	.10925156 00
RPM	.33876748 06	SPN	.45511477 02								
GCE	.10558001 03	GCT	.28156488 03	SIP	.13156310 03	CPT	.90389874 02	SIN	.90096430 02	D1	.15364722 00
REP	.48054293 05	VEP	.38805152 01	CPE	.94152259 02	CPS	.76816138 02	D2	.10310487 00	D3	.70733844-03

0 DAYS 3 HRS. 40 MIN. 4.000 SEC. 2356664566242020000000000 J.D.= 2438605.37500000 JULY 28,1964 21 00 00.000
TFL 0 DAYS 4 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.59546416 05	Y	.66927323 04	Z	-.60708126 04	DX	.31096829 01	DY	.14059345 01	DZ	.24194475 00
R	.60228092 05	DEC	-.57850694 01	RA	.64128577 01	V	.34213034 01	PTH	.69581037 02	AZ	.61583292 02
R	.60228091 05	LAT	-.57850694 01	LON	.10486383 03	VE	.46501369 01	PTE	.43591592 02	AZE	.27970965 03
XS	-.88805640 08	YS	.11304821 09	ZS	.49022587 08	DXS	-.23678608 02	DYS	-.15870818 02	DZS	-.68824544 01
XM	.38332730 06	YM	-.17865749 05	ZM	-.45619323 05	DXM	.47533397-01	DYM	.93493023 00	DZM	.39795700 00
XT	.38332730 06	YT	-.17865749 05	ZT	-.45619323 05	DXT	.47533397-01	DYT	.93493023 00	DZT	.39795700 00
RS	.15188664 09	VS	.29324521 02	RM	.38644550 06	VM	.10172137 01	RT	.38644550 06	VT	.10172137 01
GED	-.58242232 01	ALT	.53850105 05	LOS	.22660257 03	RAS	.12815160 03	RAM	.35733154 03	LOM	.95782512 02
DUT	.35CCCCCC 02	DT	.48000000 03	DR	.32063313 01	SHA	.51152454 05	DES	.18829780 02	DEM	-.67794920 01

41 WOOMERA

R	.60228091 05	LAT	-.57850694 01	LON	.10486383 03		
MIN	.22C06666 03	HA	.35016175 02	DEC	-.28620422 01	ELE	.46505760 02
CKC	.25995976 03	CKM	.15035837 01	CKT	.15035837 01	PSS	.12368973 03
UT	.36677777 01	DHA	.32547741-02	DDE	.42597096-03	DEL	-.26164543-02
ET	.3658C555 01	RGE	.55445218 05	DRG	.33997485 01	DDR	-.68450774-04
RDI	.63725840 04	PHI	-.31212509 02	THI	.13688834 03	SPS	.56292867 02
DT	.18494532 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08
BF1	.60887291 05	F1	.89887292 05	F2	.12177458 06	XA	.29668548 08
D1	.29962430 04	D2	.40591528 04	DOP	-.43838817 00	DF1	-.21920550 00

AZI	.30362893 03		
PSM	.74766409 01		
DAZ	-.28702487-02		
SLS	.18697135 03		
POL	.24531849 03		
FA	.96004999 09		
PRA	.34211867 01		
DF2	-.43841100 00		

51 JOBURG 85 FT.

R	.60228091 05	LAT	-.57850694 01	LON	.10486383 03		
MIN	.22C06666 03	HA	.27736811 03	DEC	-.32080655 01	ELE	.80270909 01
CKC	.25624875 03	CKM	.35779256 03	CKT	.35779256 03	PSS	.11588235 03
UT	.36677777 01	DHA	.35141171-02	DDE	.39307487-03	DEL	.29958452-02
ET	.3658C555 01	RGE	.59006044 05	DRG	.28989081 01	DDR	-.94684456-04
RDI	.63754553 04	PHI	-.25739277 02	THI	.27686085 02	SPS	.64097627 02
DT	.19682295 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08
BF1	.59283409 05	F1	.88283409 05	F2	.11856682 06	XA	.29668498 08
D1	.29427803 04	D2	.39522273 04	DOP	-.60639993 00	DF1	-.30321576 00

AZI	.89699315 02		
PSM	.14053878 02		
DAZ	-.18865753-02		
SLS	.18751200 03		
POL	.35384352 03		
FA	.96004999 09		
PRA	.11866992 02		
DF2	-.60643152 00		

HELICCENTRIC — EQUATORIAL COORDINATES

X	.88865186 08	Y	-.11304152 09	Z	-.49028657 08	DX	.26788291 02	DY	.17276753 02	DZ	.71243991 01
R	.15191845 09	LAT	-.18828109 02	LON	.30817190 03	V	.32662758 02	PTH	.90364341 00	AZ	.76357798 02
XE	.88805640 08	YE	-.11304821 09	ZE	-.49022587 08	DXE	.23678608 02	DYE	.15870818 02	DZE	.68824544 01
XT	.89188967 08	YT	-.11306607 09	ZT	-.49068205 08	DXT	.23726141 02	DYT	.16805748 02	DZT	.72804113 01
LTE	-.1882578C 02	LOE	.30815160 03	LTT	-.18815515 02	LOT	.30826714 03	RST	.15213907 09	VST	.29972776 02
EPS	.58117644 02	ESP	.19782341-01	SEP	.12186306 03	EPM	.16925356 03	EMP	.16652453 01	MEP	.90811589 01
MPS	.13236741 03	MSP	.90383875-01	SMP	.47541565 02	SEM	.13072857 03	EMS	.49161142 02	ESM	.11014343 00
RPM	.32711C47 C6	SPN	.52038769 02								
GCE	.1045C977 03	GCT	.28154381 03	SIP	.13206351 03	CPT	.90554881 02	SIN	.90250980 02	D1	.15912279 00
REP	.60228092 05	VEP	.34213034 01	CPE	.94974895 02	CPS	.76820712 02	D2	.10783713 00	D3	.77225978-03

0 DAYS 4 HRS. 40 MIN. 4.000 SEC. 2356664604302020000000000 J.C.= 2438605.41666666 JULY 28,1964 22 00 00.000
TFL 0 DAYS 5 HRS. 9 MIN. 52.127 SEC.

GECCENTRIC — EQUATORIAL COORDINATES

X	.70115444 05	Y	.11672156 05	Z	-.514213C1 04	DX	.27807060 01	DY	.13600593 01	DZ	.27078393 00
R	.71266093 05	DEC	-.41377123 01	RA	.94513858 01	V	.31C73157 01	PTH	.71056745 02	AZ	.61320011 02
R	.71266092 05	LAT	-.41377132 01	LON	.928613C1 02	VE	.52294820 01	PTE	.34194969 02	AZE	.27642604 03
XS	-.88890865 08	YS	.11299104 09	ZS	.48997797 08	DXS	-.2366661C 02	DYS	-.15886225 02	DZS	-.68891238 01
XM	.38348106 06	YM	-.14499367 05	ZM	-.44184678 05	DXM	.37885058-01	DYM	.93526375 00	DZM	.39906091 00
XT	.38348106 06	YT	-.14499367 05	ZT	-.44184678 05	DXT	.37885058-01	DYT	.93526375 00	DZT	.39906091 00
RS	.15188596 09	VS	.29324743 02	RM	.38629035 06	VM	.1C175476 01	RT	.38629035 06	VT	.10175476 01
GED	-.41658118 01	ALT	.64887999 05	LOS	.21160229 03	RAS	.12819238 03	RAM	.35783468 03	LOM	.81244590 02
DUT	.35COCCCO 02	DT	.48000000 03	DR	.29390253 01	SHA	.62626976 05	DES	.18819988 02	DEM	-.65679850 01

41 WOOMERA

R	.71266092 05	LAT	-.41377132 01	LON	.928613C1 02		
MIN	.28C06667 03	HA	.47255046 02	DEC	-.15666311 01	ELE	.36472756 02	AZI	.29408923 03
CKC	.26015571 03	CKM	.17315443 01	CKT	.17315443 01	PSS	.12065130 03	PSM	.10128788 02
UT	.46677777 01	DHA	.35129851-02	DDE	.30504065-03	DEL	-.2933310H-02	DAZ	-.24307087-02
ET	.4658C555 01	RGE	.67293492 05	DRG	.31950223 01	DDR	-.47634417-04	SLS	.18865353 03
RDI	.63725840 04	PHI	-.31212509 02	THI	.13688834 03	SPS	.59326866 02	POL	.23967771 03
DT	.22446690 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.60231680 05	F1	.89231680 05	F2	.12046336 06	XA	.29668527 08	PRA	.62233815 01
D1	.29743893 04	D2	.40154453 04	DOP	-.30507127 00	DF1	-.15254358 00	DF2	-.30508716 00

51 JOBURG 85 FT.

R	.71266C92 05	LAT	-.41377132 01	LON	.928613C1 02		
MIN	.28C06667 03	HA	.29048417 03	DEC	-.19738555 01	ELE	.19268624 02	AZI	.82644205 02
CKC	.2568C764 03	CKM	.35834346 03	CKT	.35834346 03	PSS	.11369706 03	PSM	.15798335 02
UT	.46677777 01	DHA	.37526153-02	DDE	.30041169-03	DEL	.32177938-02	DAZ	-.20654368-02
ET	.4658C555 01	RGE	.68907633 05	DRG	.262158C3 01	DDR	-.61819993-04	SLS	.18885942 03
RDI	.63754553 04	PHI	-.25739277 02	THI	.27686085 02	SPS	.66279143 02	POL	.35308493 03
DT	.22985109 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.58395300 05	F1	.87395299 05	F2	.11679060 06	XA	.29668470 08	PRA	.13791997 02
D1	.29131766 04	D2	.38930200 04	DOP	-.39592180 00	DF1	-.19797121 00	DF2	-.39594243 00

HELICCENTRIC — EQUATORIAL COORDINATES

X	.8896C980 08	Y	-.11297937 09	Z	-.49002938 08	DX	.26447316 02	DY	.17246284 02	DZ	.71599077 01
R	.15191998 09	LAT	-.18817664 02	LON	.30821722 03	V	.32375285 02	PTH	.62263919 00	AZ	.76269291 02
XE	.8889C865 08	YE	-.11299104 09	ZE	-.48997797 08	DXE	.2366661C 02	DYE	.15886225 02	DZE	.68891238 01
XT	.89274346 08	YT	-.11300554 09	ZT	-.49041981 08	DXT	.23704495 02	DYT	.16821489 02	DZT	.72881847 01
LTE	-.18819988 02	LOE	.30819238 03	LTT	-.18805513 02	LOT	.3083C872 03	RST	.15213572 09	VST	.29966367 02
EPS	.61471513 02	ESP	.22117329-01	SEP	.11850486 03	EPM	.16554246 03	EMP	.26399532 01	MEP	.11817564 02
MPS	.13286442 03	MSP	.87076018-01	SMP	.47048105 02	SEM	.13022668 03	EMS	.49662242 02	ESM	.11102813 00
RPM	.31687107 06	SPN	.56336924 02								
GCE	.10385542 03	GCT	.28153582 03	SIP	.13255070 03	CPT	.9C706332 02	SIN	.90392611 02	D1	.16426485 00
REP	.71266093 05	VEP	.31073157 01	CPE	.95509060 02	CPS	.76825177 02	D2	.11237614 00	D3	.83732263-03

0 DAYS 5 HRS. 40 MIN. 4.000 SEC. 2356664622342020000000000 J.C.= 2438605.45833333 JULY 28,1964 23 00 00.000
TFL 0 DAYS 6 HRS. 9 MIN. 52.127 SEC.

GECCENTRIC — EQUATORIAL COORDINATES

X	.7967C450 05	Y	.16486219 05	Z	-.41372247 04	DX	.25386582 01	DY	.13148478 01	DZ	.28594286 00
R	.81463443 05	DEC	-.29110906 01	RA	.11691215 02	V	.28732166 01	PTH	.72114097 02	AZ	.61181779 02
R	.81463440 05	LAT	-.29110906 01	LON	.80060063 02	VE	.58548337 01	PTE	.27841359 02	AZE	.27471283 03
XS	-.88976042 08	YS	.11293382 09	ZS	.48972986 08	DXS	-.23654601 02	DYS	-.15901624 02	DZS	-.68957903 01
XM	.3836C006 06	YM	-.11131944 05	ZM	-.42746124 05	DXM	.28221059-01	DYM	.93551324 00	DZM	.40013014 00
XT	.3836C006 06	YT	-.11131944 05	ZT	-.42746124 05	DXT	.28221059-01	DYT	.93551324 00	DZT	.40013014 00
RS	.15188528 09	VS	.29324967 02	RM	.38613489 06	VM	.1C178829 01	RT	.38613489 06	VT	.10178829 01
GED	-.29308946 01	ALT	.75085291 05	LOS	.196602C1 03	RAS	.12823316 03	RAM	.35833776 03	LOM	.66706604 02
DUT	.35CCCOOC 02	DT	.48000000 03	DR	.27343541 01	SHA	.73201144 05	DES	.18810190 02	DEM	-.63558179 01

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R	.81463440 05	LAT	-.29110906 01	LON	.80060063 02		
MIN	.34C06666 03	HA	.60159474 02	DEC	-.60926055 00	ELE	.25534131 02	AZI	.28600214 03
CKC	.26032683 03	CKM	.18624158 01	CKT	.18624158 01	PSS	.11835314 03	PSM	.11997730 02
UT	.56677777 01	DHA	.36423886-02	DDE	.23230613-03	DEL	-.31266914-02	DAZ	-.20861080-02
ET	.5658C555 01	RGE	.78513352 05	DRG	.30443766 01	DDR	-.37325145-04	SLS	.18999294 03
RDI	.63725840 04	PHI	-.31212509 02	THI	.13688834 03	SPS	.6162C801 02	POL	.23584164 03
DT	.26189232 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.59749255 05	F1	.88749254 05	F2	.11949851 06	XA	.29668513 08	PRA	.83600160 01
D1	.29583085 04	D2	.39832837 04	DOP	-.23904627 00	DF1	-.11952936 00	DF2	-.23905872 00

51 JOBURG 85 FT.

R	.81463440 05	LAT	-.29110906 01	LON	.80060063 02		
MIN	.34C06666 03	HA	.30428237 03	DEC	-.10053458 01	ELE	.30992469 02	AZI	.74521687 02
CKC	.25732679 03	CKM	.35886237 03	CKT	.35886237 03	PSS	.11223972 03	PSM	.16876330 02
UT	.56677777 01	DHA	.39022609-02	DDE	.24155492-03	DEL	.32677456-02	DAZ	-.25028059-02
ET	.5658C555 01	RGE	.77997021 05	DRG	.24414179 01	DDR	-.39522121-04	SLS	.18993563 03
RDI	.63754553 04	PHI	-.25739277 02	THI	.27686085 02	SPS	.67733055 02	POL	.35020707 03
DT	.26C17002 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.57818351 05	F1	.86818351 05	F2	.11563670 06	XA	.29668453 08	PRA	.15034855 02
D1	.2893945C 04	D2	.38545568 04	DOP	-.25311665 00	DF1	-.12656492 00	DF2	-.25312983 00

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.89C55712 08	Y	-.11291734 09	Z	-.48977123 08	DX	.26193259 02	DY	.17216472 02	DZ	.71817332 01
R	.15192104 09	LAT	-.18807243 02	LON	.30826216 03	V	.32156974 02	PTH	.43254478 00	AZ	.76201494 02
XE	.88976042 08	YE	-.11293382 09	ZE	-.48972986 08	DXE	.23654601 02	DYE	.15901624 02	DZE	.68957903 01
XT	.89359642 08	YT	-.11294495 09	ZT	-.49015732 08	DXT	.23682821 02	DYT	.16837137 02	DZT	.72959204 01
LTE	-.18810190 02	LOE	.30823316 03	LTT	-.18795502 02	LOT	.30835029 03	RST	.15213234 09	VST	.29959901 02
EPS	.63943985 02	ESP	.25217635-01	SEP	.11602840 03	EPM	.16264595 03	EMP	.36078639 01	MEP	.13746181 02
MPS	.13334343 03	MSP	.83344489-01	SMP	.46572313 02	SEM	.12972439 03	EMS	.50163758 02	ESM	.11124820 00
RPM	.30761439 06	SPN	.59453544 02								
GCE	.10340099 03	GCT	.28153558 03	SIP	.13302027 03	CPT	.90846877 02	SIN	.90523715 02	D1	.16920804 00
REP	.81463443 05	VEP	.28732166 01	CPE	.95891815 02	CPS	.76829568 02	D2	.11679669 00	D3	.90338504-03

0 DAYS 6 HRS. 40 MIN. 4.000 SEC. 235666464C4020200000000 J.C.= 2438605.50000000 JULY 29,1964 00 00 00.000
TFL 0 DAYS 7 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.88457515 05	Y	.21142913 05	Z	-.30915886 04	DX	.23501921 01	DY	.12727897 01	DZ	.29412199 00
R	.91001718 05	DEC	-.19468754 01	RA	.13442504 02	V	.26888481 01	PTH	.72916348 02	AZ	.61106898 02
R	.91001713 05	LAT	-.19468754 01	LON	.66770238 02	VE	.64839593 01	PTE	.23352991 02	AZE	.27367600 03
XS	-.89C61177 08	YS	.11287655 09	ZS	.48948152 08	DXS	-.23642580 02	DYS	-.15917017 02	DZS	-.69024539 01
XM	.38368424 06	YM	-.77637751 04	ZM	-.41303784 05	DXM	.18542089-01	DYM	.93567844 00	DZM	.40116449 00
XT	.38368424 06	YT	-.77637751 04	ZT	-.41303784 05	DXT	.18542089-01	DYT	.93567844 00	DZT	.40116449 00
RS	.15188459 09	VS	.29325192 02	RM	.38597910 06	VM	.10182195 01	RT	.38597910 06	VT	.10182195 01
GED	-.19601326 01	ALT	.84623536 05	LOS	.18160166 03	RAS	.12827393 03	RAM	.35884079 03	LUM	.52168518 02
DUT	.35000000 02	DT	.95999999 03	DR	.25702078 01	SHA	.83072206 05	DES	.18800381 02	DEM	-.61430080 01

41 WOOMERA

R	.91001713 05	LAT	-.19468754 01	LON	.66770238 02						
MIN	.40006666 03	HA	.73410459 02	DEC	.13532056 00	ELE	.14061373 02	AZI	.27889413 03		
CKC	.26036946 03	CKM	.19098950 01	CKT	.19098950 01	PSS	.11645432 03	PSM	.13418234 02		
UT	.66677777 01	DHA	.37124636-02	DDE	.18440569-03	DEL	-.32355332-02	DAZ	-.18861725-02		
ET	.66580555 01	RGE	.89243224 05	DRG	.29192866 01	DDR	-.32910745-04	SLS	.19110558 03		
RDI	.63725840 04	PHI	-.31212509 02	THI	.13688834 03	SPS	.63515548 02	POL	.23350340 03		
DT	.29768331 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09		
BF1	.59348669 05	F1	.88348669 05	F2	.11869734 06	XA	.29668500 08	PRA	.10150147 02		
D1	.29449556 04	D2	.39565779 04	DOP	-.21077456 00	DF1	-.10539276 00	DF2	-.21078553 00		

51 JOBURG 85 FT.

R	.91001713 05	LAT	-.19468754 01	LON	.66770238 02						
MIN	.40006666 03	HA	.31851875 03	DEC	-.21370125 00	ELE	.42567190 02	AZI	.64075051 02		
CKC	.25781839 03	CKM	.35935881 03	CKT	.35935881 03	PSS	.11125244 03	PSM	.17527054 02		
UT	.66677777 01	DHA	.39998659-02	DDE	.20042047-03	DEL	.31229240-02	DAZ	-.34043250-02		
ET	.66580555 01	RGE	.86567792 05	DRG	.23298552 01	DDR	-.23276946-04	SLS	.19084120 03		
RDI	.63754553 04	PHI	-.25739277 02	THI	.27686085 02	SPS	.68717131 02	POL	.34425126 03		
DT	.28875903 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09		
BF1	.57461084 05	F1	.86461084 05	F2	.11492217 06	XA	.29668442 08	PRA	.15839593 02		
D1	.28820362 04	D2	.38307390 04	DOP	-.14907557 00	DF1	-.74541665-01	DF2	-.14908333 00		

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.89145634 08	Y	-.11285541 09	Z	-.48951244 08	DX	.25992772 02	DY	.17189806 02	DZ	.71965759 01
R	.15192177 09	LAT	-.18796838 02	LON	.30830682 03	V	.31982875 02	PTH	.29482597 00	AZ	.76146232 02
XE	.89061177 08	YE	-.11287655 09	ZE	-.48948152 08	DXE	.23642580 02	DYE	.15917017 02	DZE	.69024539 01
XT	.89444861 08	YT	-.11288431 09	ZT	-.48989455 08	DXT	.23661122 02	DYT	.16852695 02	DZT	.73036184 01
LTE	-.18800381 02	LOE	.30827393 03	LTT	-.18785483 02	LOT	.30835185 03	RST	.15212895 09	VST	.29953378 02
EPS	.65872876 02	ESP	.30486634-01	SEP	.11409579 03	EPM	.16028349 03	EMP	.45621448 01	MEP	.15154358 02
MPS	.13380421 03	MSP	.81264261-01	SMP	.46114491 02	SEM	.12922169 03	EMS	.50665688 02	ESM	.11190583 00
RPM	.29908959 06	SPN	.61853915 02								
GCE	.10306084 03	GCT	.28154042 03	SIP	.13347184 03	CPT	.90978397 02	SIN	.90646026 02	D1	.17403105 00
REP	.91001718 05	VEP	.26888481 01	CPE	.96183705 02	CPS	.76833906 02	D2	.12114620 00	D3	.97102980-03

0 DAYS 7 HRS. 40 MIN. 4.000 SEC. 235666465644202000000000 J.C.= 2438605.54166666 JULY 29,1964 01 00 00.000
TFL 0 DAYS 8 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.96634568 05	Y	.25654540 05	Z	-.20242029 04	DX	.21975678 01	DY	.12342433 01	DZ	.29837468 00
R	.10000246 06	DEC	-.11598327 01	RA	.14867916 02	V	.25380481 01	PTH	.73549291 02	AZ	.61067456 02
R	.10000246 06	LAT	-.11598327 01	LON	.53154586 02	VE	.71010563 01	PTE	.20046765 02	AZE	.27298790 03
XS	-.89146271 08	YS	.11281922 09	ZS	.48923289 08	DXS	-.23630547 02	DYS	-.15932404 02	DZS	-.69091148 01
XM	.38373354 06	YM	-.43951517 04	ZM	-.39857778 05	DXM	.88491669-02	DYM	.93575924 00	DZM	.40216380 00
XT	.38373354 06	YT	-.43951517 04	ZT	-.39857778 05	DXT	.88491669-02	DYT	.93575924 00	DZT	.40216380 00
RS	.15188391 09	VS	.29325417 02	RM	.38582300 06	VM	.10185575 01	RT	.38582300 06	VT	.10185575 01
GED	-.11677345 01	ALT	.93674264 05	LOS	.16660137 03	RAS	.12831470 03	RAM	.35934378 03	LUM	.37630451 02
DUT	.35000000 02	DT	.95999999 03	DR	.24341499 01	SHA	.92371594 05	DES	.18790561 02	DEM	-.59295698 01

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R	.10000246 06	LAT	-.11598327 01	LON	.53154586 02						
MIN	.46006666 03	HA	.86853863 02	DEC	.73571382 00	ELE	.23085433 01	AZI	.27226104 03		
CKC	.26033927 03	CKM	.18881072 01	CKT	.18881072 01	PSS	.11478697 03	PSM	.14557260 02		
UT	.76677777 01	DHA	.37525960-02	DDE	.15103550-03	DEL	-.32853301-02	DAZ	-.18205630-02		
ET	.76580554 01	RGE	.99542847 05	DRG	.28032665 01	DDR	-.31986371-04	SLS	.19205427 03		
RDI	.63725840 04	PHI	-.31212509 02	THI	.13688834 03	SPS	.65178946 02	POL	.23242682 03		
DT	.33203915 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09		
BF1	.58977129 05	F1	.87977128 05	F2	.11795426 06	XA	.29668489 08	PRA	.11747809 02		
D1	.29325709 04	D2	.39318086 04	DOP	-.20485447 00	DF1	-.10243257 00	DF2	-.20486514 00		

51 JOBURG 85 FT.

R	.10000246 06	LAT	-.11598327 01	LON	.53154586 02						
MIN	.46006666 03	HA	.33303924 03	DEC	.44982259 00	ELE	.53077247 02	AZI	.48997626 02		
CKC	.25828047 03	CKM	.35982930 03	CKT	.35982930 03	PSS	.11057459 03	PSM	.17895512 02		
UT	.76677777 01	DHA	.40620638-02	DDE	.16951644-03	DEL	.26370813-02	DAZ	-.51506144-02		
ET	.76580554 01	RGE	.94832257 05	DRG	.22686505 01	DDR	-.11372945-04	SLS	.19163319 03		
RDI	.63754553 04	PHI	-.25739277 02	THI	.27686085 02	SPS	.69391922 02	POL	.33313505 03		
DT	.31632632 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09		
BF1	.57265084 05	F1	.86265083 05	F2	.11453017 06	XA	.29668436 08	PRA	.16360169 02		
D1	.28755027 04	D2	.38176722 04	DOP	-.72837223-01	DF1	-.36420508-01	DF2	-.72841017-01		

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.89242905 08	Y	-.11279356 09	Z	-.48925313 08	DX	.25828114 02	DY	.17166647 02	DZ	.72074895 01
R	.15192225 09	LAT	-.18786448 02	LON	.30835124 03	V	.31839177 02	PTH	.19023357 00	AZ	.76099239 02
XE	.89146271 08	YE	-.11281922 09	ZE	-.48923289 08	DXE	.23630547 02	DYE	.15932404 02	DZE	.69091148 01
XT	.89530004 08	YT	-.11282361 09	ZT	-.48963147 08	DXT	.23635396 02	DYT	.16868163 02	DZT	.73112786 01
LTE	-.18790561 02	LOE	.30831470 03	LTT	-.18775454 02	LOT	.30843339 03	RST	.15212554 09	VST	.29946798 02
EPS	.67437279 02	ESP	.32805301-01	SEP	.11252788 03	EPM	.15829092 03	EMP	.55016040 01	MEP	.16207462 02
MPS	.13424760 03	MSP	.78819662-01	SMP	.45673845 02	SEM	.12871856 03	EMS	.51168033 02	ESM	.11320963 00
RPM	.29113602 06	SPN	.63780563 02								
GCE	.10275338 03	GCT	.28154883 03	SIP	.13390615 03	CPT	.91102262 02	SIN	.90760809 02	D1	.17878558 00
REP	.10000246 06	VEP	.25380481 01	CPE	.96416069 02	CPS	.76838201 02	D2	.12545762 00	D3	.10407047-02

0 DAYS 8 HRS. 40 MIN. 4.000 SEC. 2356664674502020C0000000 J.D.= 2438605.58333334 JULY 29,1964 02 00 00.000
TFL 0 DAYS 9 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.10431035 06	Y	.30033420 05	Z	-.94609617 03	DX	.20703545 01	DY	.11989851 01	DZ	.30026649 00
R	.10855206 06	DEC	-.49937391 00	RA	.16062361 02	V	.24112430 01	PTH	.74062940 02	AZ	.61C49194 02
R	.10855206 06	LAT	-.49937391 00	LON	.39307968 02	VE	.77004376 01	PTE	.17523389 02	AZE	.27250145 03
XS	-.89231324 08	YS	.11276183 09	ZS	.48898404 08	DXS	-.23618502 02	DYS	-.15947784 02	DZS	-.69157726 01
XM	.38374794 06	YM	-.10263895 04	ZM	-.38408238 05	DXM	-.85695741-03	DYM	.93575537 00	DZM	.40312789 00
XT	.38374794 06	YT	-.10263895 04	ZT	-.38408238 05	DXT	-.85695741-03	DYT	.93575537 00	DZT	.40312789 00
RS	.15188322 09	VS	.29325644 02	RM	.38566659 06	VM	.10188969 01	RT	.38566659 06	VT	.10188969 01
GED	-.50277685 00	ALT	.10217385 06	LOS	.15160107 03	RAS	.12835547 03	RAM	.35984675 03	LOM	.23092354 02
DUT	.35000000 02	DT	.95999999 03	DR	.23185643 01	SHA	.10119238 06	DES	.18780733 02	DEM	-.57155167 01

41 WOOMERA

R	.10855206 06	LAT	-.49937391 00	LON	.39307968 02				
MIN	.52006666 03	HA	.10041097 03	DEC	.12338438 01	ELE	-.95363364 01	AZI	.26562632 03
CKC	.26025128 03	CKM	.18111254 01	CKT	.18111254 01	PSS	.11326262 03	PSM	.15505748 02
UT	.86677776 01	DHA	.37773775-02	DDE	.12695988-03	DEL	-.32874688-02	DAZ	-.18890686-02
ET	.8658C554 01	RGE	.10942575 06	DRG	.268656C4 01	DDR	-.33C97C58-04	SLS	.19287646 03
RDI	.63725840 04	PHI	-.31212509 02	THI	.13688834 03	SPS	.66699466 02	PCL	.23255358 03
DT	.36500497 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.58603391 05	F1	.87603391 05	F2	.11720678 06	XA	.29668477 08	PRA	.13231767 02
D1	.29201130 04	D2	.39068927 04	DOP	-.21196778 00	DF1	-.10598941 00	DF2	-.21197882 00

51 JOBURG 85 FT.

R	.10855206 06	LAT	-.49937391 00	LON	.39307968 02				
MIN	.52006666 03	HA	.34773410 03	DEC	.10144555 01	ELE	.60737571 02	AZI	.25757061 02
CKC	.2587C483 03	CKM	.26466641 00	CKT	.26466641 00	PSS	.11CC9342 03	PSM	.18078896 02
UT	.86677776 01	DHA	.40979160-02	DDE	.14503214-03	DEL	.14706284-02	DAZ	-.78292036-02
ET	.8658C554 01	RGE	.10294543 06	DRG	.22436311 01	DDR	-.3C946761-05	SLS	.19234621 03
RDI	.63754553 04	PHI	-.25739277 02	THI	.27686085 02	SPS	.6987C117 02	PCL	.31349578 03
DT	.34338895 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.57184962 05	F1	.86184963 05	F2	.11436992 06	XA	.29668433 08	PRA	.16706374 02
D1	.28728321 04	D2	.38123308 04	DOP	-.19819636-01	DF1	-.991C3338-02	DF2	-.19820668-01

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.89335634 08	Y	-.11273180 09	Z	-.48899351 08	DX	.25688857 02	DY	.17146769 02	DZ	.72160391 01
R	.15192255 09	LAT	-.18776068 02	LON	.30839548 03	V	.31717507 02	PTH	.10802029 00	AZ	.76058049 02
XE	.89231324 08	YE	-.11276183 09	ZE	-.48898404 08	DXE	.23618502 02	DYE	.15947784 02	DZE	.69157726 01
XT	.89615071 08	YT	-.11276286 09	ZT	-.48936813 08	DXT	.23617645 02	DYT	.16883540 02	DZT	.73189005 01
LTE	-.18780733 02	LOE	.30835547 03	LTT	-.18765418 02	LOT	.30847492 03	RST	.15212210 09	VST	.29940163 02
EPS	.68742454 02	ESP	.36308338-01	SEP	.11121938 03	EPM	.15656780 03	EMP	.64265087 01	MEP	.17005683 02
MPS	.13467473 03	MSP	.75328913-01	SMP	.45249296 02	SEM	.12821507 03	EMS	.51670799 02	ESM	.11428477 00
RPM	.28364324 06	SPN	.65374089 02								
GCE	.10257563 03	GCT	.28155983 03	SIP	.13432426 03	CPT	.91219499 02	SIN	.90869027 02	D1	.18350860 00
REP	.10855206 06	VEP	.24112430 01	CPE	.96606945 02	CPS	.76842464 02	D2	.12975560 00	D3	.11127876-02

0 DAYS 9 HRS. 40 MIN. 4.000 SEC. 2356664712542020000000C0 J.D.= 2438605.62500000 JULY 29,1964 03 00 00.000
TFL 0 DAYS 10 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.11156362 06	Y	.34290744 05	Z	.13594511 03	DX	.19619583 01	DY	.11666528 01	DZ	.30067029 00
R	.11671467 06	DEC	.66737777-01	RA	.17085592 02	V	.23023384 01	PTH	.74488729 02	AZ	.61044182 02
R	.11671467 06	LAT	.66737777-01	LON	.25290132 02	VE	.82805081 01	PTE	.15540305 02	AZE	.27214133 03
XS	-.89316327 08	YS	.11270439 09	ZS	.48873498 08	DXS	-.23606447 02	DYS	-.15963157 02	DZS	-.69224277 01
XM	.38372736 06	YM	.23421925 04	ZM	-.36955297 05	DXM	-.10575398-01	DYM	.93566666 00	DZM	.40405662 00
XT	.38372736 06	YT	.23421925 04	ZT	-.36955297 05	DXT	-.10575398-01	DYT	.93566666 00	DZT	.40405662 00
RS	.15188254 09	VS	.29325871 02	RM	.38550987 06	VM	.10192378 01	RT	.38550987 06	VT	.10192378 01
GED	.67192580-01	ALT	.11033646 06	LOS	.13660077 03	RAS	.12839623 03	RAM	.34971507 00	LOM	.85542526 01
DUT	.35000000 02	DT	.95999999 03	DR	.22184823 01	SHA	.10960352 06	DES	.18770897 02	DEM	-.55008686 01

51 JOBURG 85 FT.

R	.11671467 06	LAT	.66737777-01	LON	.25290132 02				
MIN	.58006666 03	HA	.25199032 01	DEC	.14992880 01	ELE	.62652629 02	AZI	.35450974 03
CKC	.25908131 03	CKM	.65411483 00	CKT	.65411483 00	PSS	.10972437 03	PSM	.18146205 02
UT	.96677776 01	DHA	.41134523-02	DDE	.12493943-03	DEL	-.47897855-03	DAZ	-.88942590-02
ET	.9658C554 01	RGE	.11101499 06	DRG	.22424766 01	DDR	-.19386009-05	SLS	.19300170 03
RDI	.63754553 04	PHI	-.25739277 02	THI	.27686085 02	SPS	.70236217 02	PCL	.28562462 03
DT	.3703C611 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.57181265 05	F1	.86181265 05	F2	.11436253 06	XA	.29668433 08	PRA	.16961641 02
D1	.28727C88 04	D2	.38120843 04	DOP	.12415633-01	DF1	.6208140C-02	DF2	.12416280-01

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.89427890 08	Y	-.11267010 09	Z	-.48873362 08	DX	.25568405 02	DY	.17129810 02	DZ	.72230980 01
R	.15192269 09	LAT	-.18765697 02	LON	.30843954 03	V	.31612448 02	PTH	.41684644-01	AZ	.76021121 02
XE	.89316327 08	YE	-.11270439 09	ZE	-.48873498 08	DXE	.23606447 02	DYE	.15963157 02	DZE	.69224277 01
XT	.8970C054 08	YT	-.11270205 09	ZT	-.48910453 08	DXT	.23595871 02	DYT	.16898824 02	DZT	.73264843 01
LTE	-.18772897 02	LOE	.30839623 03	LTT	-.18755375 02	LOT	.30851644 03	RST	.15211865 09	VST	.29933472 02
EPS	.69855006 02	ESP	.41377734-01	SEP	.11010366 03	EPM	.15504905 03	EMP	.73375299 01	MEP	.17613405 02
MPS	.13508669 03	MSP	.73354886-01	SMP	.44839766 02	SEM	.12771114 03	EMS	.52173981 02	ESM	.11471201 00
RPM	.27653132 06	SPN	.66722456 02								
GCE	.10235369 03	GCT	.28157280 03	SIP	.13472720 03	CPT	.91330904 02	SIN	.90971417 02	D1	.18822832 00
REP	.11671467 06	VEP	.23023383 01	CPE	.96767542 02	CPS	.76846700 02	D2	.13405968 00	D3	.11876208-02

0 DAYS 10 HRS. 40 MIN. 4.000 SEC. 2356664730602020C0000000 J.D.= 2438605.66666666 JULY 29,1964 04 00 00.000

TFL 0 DAYS 11 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.11845369 06	Y	.38436394 05	Z	.12175751 04	DX	.18679750 01	DY	.11368822 01	DZ	.30010414 00
R	.12453961 06	DEC	.56016771 00	RA	.17977446 02	V	.22072368 01	PTH	.74847547 02	AZ	.61047719 02
R	.12453961 06	LAT	.56016771 00	LON	.11140914 02	VE	.88413741 01	PTE	.13943753 02	AZE	.27186519 03
XS	-.89401293 08	YS	.11264690 09	ZS	.48848564 08	DXS	-.23594378 02	DYS	-.15978524 02	DZS	-.69290798 01
XM	.38367178 06	YM	.57103155 04	ZM	-.35499071 05	DXM	-.20305397-01	DYM	.93549289 00	DZM	.40494977 00
XT	.38367178 06	YT	.57103155 04	ZT	-.35499071 05	DXT	-.20305397-01	DYT	.93549289 00	DZT	.40494977 00
RS	.15188185 09	VS	.29326099 02	RM	.38535285 06	VM	.10195801 01	RT	.38535285 06	VT	.10195801 01
GED	.56398489 00	ALT	.11816141 06	LOS	.12160045 03	RAS	.12843699 03	RAM	.85268763 00	LUM	.35401615 03
DUT	.35000000 02	DT	.95999999 03	DR	.21304995 01	SHA	.11765786 06	DES	.18761052 02	DEM	-.52856366 01

51 JOBURG 85 FT.

R	.12453961 06	LAT	.56016771 00	LON	.11140914 02						
MIN	.64000666 03	HA	.17332342 02	DEC	.19179470 01	ELE	.57657090 02	AZI	.32618233 03		
CKC	.25940049 03	CKM	.98778536 00	CKT	.98778536 00	PSS	.10940277 03	PSM	.18147323 02		
UT	.10667778 02	DHA	.41134516-02	DDE	.10813449-03	DEL	-.21557442-02	DAZ	-.65465004-02		
ET	.10658055 02	RGE	.11910652 06	DRG	.22540763 01	DDR	.40463687-05	SLS	.19361278 03		
RDI	.63754553 04	PHI	-.25739277 02	THI	.27686085 02	SPS	.70554861 02	POL	.26056363 03		
DT	.39729654 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09		
BF1	.57218412 05	F1	.86218411 05	F2	.11443682 06	XA	.29668434 08	PRA	.17190273 02		
D1	.28739470 04	D2	.38145608 04	DOP	.25914684-01	DF1	.12958017-01	DF2	.25916034-01		

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.89519746 08	Y	-.11260846 09	Z	-.48847346 08	DX	.25462353 02	DY	.17115407 02	DZ	.72291839 01
R	.15192272 09	LAT	-.18755330 02	LON	.30848346 03	V	.31520306 02	PTH	-.12953018-01	AZ	.75987435 02
XE	.89401293 08	YE	-.11264690 09	ZE	-.48848564 08	DXE	.23594378 02	DYE	.15978524 02	DZE	.69290798 01
XT	.89784964 08	YT	-.11264118 09	ZT	-.48884063 08	DXT	.23574673 02	DYT	.16914017 02	DZT	.73340295 01
LTE	-.18761052 02	LUE	.30843699 03	LTT	-.18745321 02	LOT	.30855794 03	RST	.15211518 09	VST	.29926725 02
EPS	.70819499 02	ESP	.43114612-01	SEP	.10913612 03	EPM	.15369044 03	EMP	.82354563 01	MEP	.18074091 02
MPS	.13546452 03	MSP	.70637088-01	SMP	.44444240 02	SEM	.12720681 03	EMS	.52677584 02	ESM	.11556174 00
RPM	.26974013 06	SPN	.67883948 02								
GCE	.10223863 03	GCT	.28158728 03	SIP	.13511599 03	CPT	.91437107 02	SIN	.91068571 02	D1	.19296749 00
REP	.12453961 06	VEP	.22072368 01	CPE	.96905229 02	CPS	.76850919 02	D2	.13838613 00	D3	.12655309-02

0 DAYS 11 HRS. 40 MIN. 4.000 SEC. 2356664746642020000000000 J.C.= 2438605.70833333 JULY 29,1964 05 00 00.000

TFL 0 DAYS 12 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.12502661 06	Y	.42478980 05	Z	.22959243 04	DX	.17853340 01	DY	.11093658 01	DZ	.29889062 00
R	.13206585 06	DEC	.99611990 00	RA	.18765681 02	V	.21230641 01	PTH	.75153910 02	AZ	.61056868 02
R	.13206585 06	LAT	.99611990 00	LON	.35688807 03	VE	.93838374 01	PTE	.12632349 02	AZE	.27166748 03
XS	-.89486213 08	YS	.11258934 09	ZS	.48823607 08	DXS	-.23582299 02	DYS	-.15993885 02	DZS	-.69357291 01
XM	.38358115 06	YM	.90776548 04	ZM	-.34039695 05	DXM	-.30046046-01	DYM	.93523389 00	DZM	.40580721 00
XT	.38358115 06	YT	.90776548 04	ZT	-.34039695 05	DXT	-.30046046-01	DYT	.93523389 00	DZT	.40580721 00
RS	.15188116 09	VS	.29326328 02	RM	.38519554 06	VM	.10199239 01	RT	.38519554 06	VT	.10199239 01
GED	.10029069 01	ALT	.12568765 06	LOS	.10660014 03	RAS	.12847774 03	RAM	.13556832 01	LUM	.33947808 03
DUT	.35000000 02	DT	.95999999 03	DR	.20521912 01	SHA	.12539708 06	DES	.18751197 02	DEM	-.50698359 01

51 JOBURG 85 FT.

R	.13206585 06	LAT	.99611990 00	LON	.35688807 03						
MIN	.70006666 03	HA	.32123161 02	DEC	.22810526 01	ELE	.48158002 02	AZI	.30720405 03		
CKC	.25965545 03	CKM	.12584111 01	CKT	.12584111 01	PSS	.10908004 03	PSM	.18117854 02		
UT	.11667778 02	DHA	.41021030-02	DDE	.94000608-04	DEL	-.30005173-02	DAZ	-.41754637-02		
ET	.11658055 02	RGE	.12724772 06	DRG	.22685356 01	DDR	.35942184-05	SLS	.19418707 03		
RDI	.63754553 04	PHI	-.25739277 02	THI	.27686085 02	SPS	.70874598 02	POL	.24485329 03		
DT	.42445264 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09		
BF1	.57264716 05	F1	.86264716 05	F2	.11452943 06	XA	.29668435 08	PRA	.17440526 02		
D1	.28754905 04	D2	.38176477 04	DOP	.23018919-01	DF1	.11510059-01	DF2	.23020117-01		

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.89611239 08	Y	-.11254686 09	Z	-.48821311 08	DX	.25367633 02	DY	.17103231 02	DZ	.72346196 01
R	.15192265 09	LAT	-.18744971 02	LON	.30852725 03	V	.31438464 02	PTH	-.58704621-01	AZ	.75956289 02
XE	.89486213 08	YE	-.11258934 09	ZE	-.48823607 08	DXE	.23582299 02	DYE	.15993885 02	DZE	.69357291 01
XT	.89869794 08	YT	-.11258027 09	ZT	-.48857646 08	DXT	.23552253 02	DYT	.16929119 02	DZT	.73415363 01
LTE	-.18751197 02	LUE	.30847774 03	LTT	-.18735261 02	LOT	.30859942 03	RST	.15211169 09	VST	.29919923 02
EPS	.71667080 02	ESP	.46393702-01	SEP	.10828563 03	EPM	.15246062 03	EMP	.91210768 01	MEP	.18418295 02
MPS	.13586916 03	MSP	.68528040-01	SMP	.44061802 02	SEM	.12670206 03	EMS	.53181610 02	ESM	.11598427 00
RPM	.26322305 06	SPN	.68898956 02								
GCE	.10210435 03	GCT	.28160295 03	SIP	.13549150 03	CPT	.91538624 02	SIN	.91160963 02	D1	.19774534 00
REP	.13206585 06	VEP	.21230641 01	CPE	.97025088 02	CPS	.76855116 02	D2	.14274909 00	D3	.13668419-02

0 DAYS 12 HRS. 40 MIN. 4.000 SEC. 2356664764702020000000000 J.C.= 2438605.75000000 JULY 29,1964 06 00 00.000

TFL 0 DAYS 13 HRS. 9 MIN. 52.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.13131902 06	Y	.46426026 05	Z	.33690651 04	DX	.17118179 01	DY	.10837615 01	DZ	.29723836 00
R	.13932484 06	DEC	.13856242 01	RA	.19470346 02	V	.20477329 01	PTH	.75418260 02	AZ	.61069734 02
R	.13932484 06	LAT	.13856242 01	LON	.34255168 03	VE	.99089536 01	PTE	.11536863 02	AZE	.27147192 03
XS	-.89571086 08	YS	.11253174 09	ZS	.48798629 08	DXS	-.23570209 02	DYS	-.16009238 02	DZS	-.69423756 01
XM	.38345543 06	YM	.12443902 05	ZM	-.32577299 05	DXM	-.39796488-01	DYM	.93488944 00	DZM	.40662879 00
XT	.38345543 06	YT	.12443902 05	ZT	-.32577299 05	DXT	-.39796488-01	DYT	.93488944 00	DZT	.40662879 00
RS	.15188047 09	VS	.29326558 02	RM	.38503792 06	VM	.10202691 01	RT	.38503792 06	VT	.10202691 01
GED	.13950633 01	ALT	.13294665 06	LOS	.91599824 02	RAS	.12851849 03	RAM	.18587139 01	LUM	.32494005 03
DUT	.35000000 02	DT	.19200000 04	DR	.19817744 01	SHA	.13285479 06	DES	.18741334 02	DEM	-.48534862 01

12 GOLDSTONE ECMC

R	.13932484 06	LAT	.13856242 01	LON	.34255168 03						
MIN	.76006666 03	HA	.25854139 03	DEC	-.12110181 00	ELE	-.94225498 01	AZI	.83448844 02		
CKC	.25578783 03	CKM	.35740738 03	CKT	.35740738 03	PSS	.10606264 03	PSM	.19637275 02		
UT	.12667778 02	DHA	.39925845-02	DDE	.12284724-03	DEL	.33160993-02	DAZ	.22573915-02		
ET	.12658055 02	RGE	.14022613 06	DRG	.16172597 01	DDR	-.23875866-04	SLS	.19503065 03		
RDI	.63718688 04	PHI	.35117467 02	THI	.24319483 03	SPS	.73886538 02	POL	.55139880 02		
DT	.46774395 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09		
BF1	.55175082 05	F1	.84179082 05	F2	.11035816 06	XA	.29668371 08	PRA	.21572098 02		
D1	.28059694 04	D2	.36786055 04	DOP	-.15291131 00	DF1	-.76455635-01	DF2	-.15291927 00		

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51 JOBURG 85 FT.
     R  .13932484 06     LAT .12856242 01     LON .34255168 03
   MIN .76006666 03      HA .46858425 02     DEC .25975050 01     ELE .36558418 02     AZI .29484345 03
   CKC .25984266 03     CKM .14622274 01     CKT .14622274 01     PSS .10872163 03     PSM .18082052 02
    UT .12667778 02     DHA .40831858-02     DDE .82168763-04     DEL-.33849144-02     DAZ-.28354279-02
    ET .12658C55 02     RGE .13543320 06     DRG .22774055 01     DDR .10195969-05     SLS .19472857 03
   RDI .63754553 04     PHI-.25739277 02     THI .27686085 02     SPS .71229994 02     PDL .23588185 03
    DT .45175646 00     RFB .96004999 09     RF1 .96004999 09     RF2 .29668212 08      FA .96004999 09
   BF1 .57293122 05      F1 .86293121 05      F2 .11458624 06      XA .29668437 08     PRA .17746331 02
    D1 .28764373 04      D2 .38195414 04     DOP .65299367-02     DF1 .3265138?-02     DF2 .65302767-02

      HELICCENTRIC                                                                              EQUATORIAL COORDINATES

     X  .89702405 08      Y -.11248531 09      Z -.48795259 08     DX  .25282026 02     DY  .17092999 02     DZ  .72396139 01
     R  .15192249 09    LAT -.18734616 02    LON  .30857092 03      V  .31365004 02    PTH -.97535954-01     AZ  .75927173 02
    XE  .89571086 08     YE -.11253174 09     ZE -.48798629 08    DXE  .23570209 02    DYE  .16009238 02    DZE  .69423756 01
    XT  .89554541 08     YT -.11251929 09     ZT -.48831205 08    DXT  .23530412 02    DYT  .16944127 02    DZT  .73490044 01
   LTE -.18741334 02    LUE  .30851849 03    LTT -.18725192 02    LUT  .30864089 03    RST  .15210818 09    VST  .29913067 02
   EPS  .72420286 02    ESP  .49455853-01    SEP  .10752960 03    EPM  .15133666 03    EMP  .99951144 01    MEP  .18668219 02
   MPS  .13624143 03    MSP  .67085183-01    SMP  .43691625 02    SEM  .12619690 03    EMS  .53686057 02    ESM  .11703392 00
   RPM  .25694298 06    SPN  .69796488 02
   GCE  .10198656 03    GCT  .28161956 03    SIP  .13585454 03    CPT  .91635881 02    SIN  .91248989 02     D1  .20257875 00
   RLP  .13932484 06    VEP  .20477329 01    CPE  .97130740 02    CPS  .76859298 02     D2  .14716132 00     D3  .14318846-02

   0 DAYS 13 HRS. 40 MIN.  4.000 SEC.          2356665002742020C0000000 J.C.= 2438605.79166666  JULY 29,1964 07 00 00.000
                                                TFL    0 DAYS 14 HRS.  9 MIN. 52.127 SEC.

      GEOCENTRIC                                                                                EQUATORIAL COORDINATES

     X  .13736065 06      Y  .50284117 05      Z  .44356842 04     DX  .16457794 01     DY  .10598895 01     DZ  .29528645 00
     R  .14634247 06    DEC  .17369171 01     RA  .20106349 02      V  .19796842 01    PTH -.75648347 02     AZ  .61085041 02
     R  .14634246 06    LAT  .17369171 01    LON  .32814662 03     VE  .10417833 02    PTL  .10608556 02    AZE  .27132770 03
    XS -.89655919 08     YS  .11247408 09     ZS  .48773624 08    DXS -.23558106 02    DYS -.16024585 02    DZS -.69490191 01
    XM  .38329460 06     YM  .15808762 05     ZM -.31112009 05    DXM -.49555902-01    DYM  .93445939 00    DZM  .40741430 00
    XT  .38329460 06     YT  .15808762 05     ZT -.31112009 05    DXT -.49555902-01    DYT  .93445939 00    DZT  .40741430 00
    RS  .15187978 09     VS  .29326789 02     RM  .38488001 06     VM  .10206158 01     RT  .38488001 06     VT  .10206158 01
   GED  .17487465 01    ALT  .13996428 06    LOS  .76599500 02    RAS  .12855923 03    RAM  .23617940 01    LOM  .31040206 03
   DUT  .35000000 02     DT  .19200000 04     DR  .19179036 01    SHA  .14005859 06    DES  .18731462 02    DEM -.46365979 01


12 GOLDSTONE ECHO
     R  .14634246 06    LAT  .17369171 01    LON  .32814662 03
   MIN .82006666 03      HA  .27300905 03     DEC  .30245929 00     ELE  .26350784 01     AZI  .91484486 02
   CKC  .25995193 03     CKM  .35762884 03     CKT  .35762884 03     PSS  .10542051 03     PSM  .19818452 02
    UT  .13667778 02     DHA  .40440295-02     DDE  .11274967-03     DEL  .34717039-02     DAZ  .22379969-02
    ET  .13658055 02     RGE  .14591103 06     DRG  .15458958 01     DDR-.15744417-04     SLS  .19537583 03
   RDI  .63718688 04     PHI  .35117467 02     THI  .24319483 03     SPS  .74526440 02     PDL  .54689032 02
    DT  .48676673 00     RFB  .96004999 09     RF1  .96004999 09     RF2  .29668212 08      FA  .96004999 09
   BF1  .54950560 05      F1  .83950561 05      F2  .10990112 06      XA  .29668364 08     PRA  .22145507 02
    D1  .27983520 04      D2  .36633707 04     DOP-.10083670 00     DF1-.50420978-01     DF2-.10084196 00
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51 JOBURG 85 FT.
     R  .14634246 06    LAT  .17369171 01    LON  .32814662 03
   MIN .82006666 03      HA  .61517063 02     DEC  .28751246 01     ELE  .24032536 02     AZI  .28601850 03
   CKC  .25996232 03     CKM  .15992311 01     CKT  .15992311 01     PSS  .10830530 03     PSM  .18055134 02
    UT  .13667778 02     DHA  .40600578-02     DDE  .72385104-04     DEL-.35512999-02     DAZ-.21444942-02
    ET  .13658055 02     RGE  .14363014 06     DRG  .22739229 01     DDR-.31824305-05     SLS  .19523898 03
   RDI  .63754553 04     PHI-.25739277 02     THI  .27686085 02     SPS  .71643268 02     PDL  .23071291 03
    DT  .47905850 00     RFB  .96004999 09     RF1  .96004999 09     RF2  .29668212 08      FA  .96004999 09
   BF1  .57281969 05      F1  .86281969 05      F2  .11456394 06      XA  .29668436 08     PRA  .18128756 02
    D1  .28766656 04      D2  .38187979 04     DOP-.20381652-01     DF1-.10191357-01     DF2-.20382714-01

      HELICCENTRIC                                                                              EQUATORIAL COORDINATES

     X  .89793279 08      Y -.11242379 09      Z -.48769188 08     DX  .25203886 02     DY  .17064474 02     DZ  .72443055 01
     R  .15192227 09    LAT -.18724262 02    LON  .30861448 03      V  .31298483 02    PTH -.13087069 00     AZ  .75899719 02
    XE  .89655919 08     YE -.11247408 09     ZE -.48773624 08    DXE  .23558106 02    DYE  .16024585 02    DZE  .69490191 01
    XT  .90039213 08     YT -.11245827 09     ZT -.48804735 08    DXT  .23508550 02    DYT  .16959044 02    DZT  .73564333 01
   LTE -.18731462 02    LUE  .30855923 03    LTT -.18715114 02    LUT  .30868236 03    RST  .15210465 09    VST  .29906157 02
   EPS  .73095908 02    ESP  .51869734-01    SEP  .10685127 03    EPM  .15030129 03    EMP  .10858266 02    MEP  .18840436 02
   MPS  .13662210 03    MSP  .63719410-01    SMP  .43332971 02    SEM  .12569132 03    EMS  .54190928 02    ESM  .11724273 00
   RPM  .25086987 06    SPN  .70598012 02
   GCE  .10188215 03    GCT  .28163690 03    SIP  .13620584 03    CPT  .91729237 02    SIN  .91332979 02     D1  .20748304 00
   REP  .14634247 06    VEP  .19796842 01    CPE  .97224854 02    CPS  .76863468 02     D2  .15163464 00     D3  .15210026-02

   0 DAYS 14 HRS. 40 MIN.  4.000 SEC.          2356665021002020C0000000 J.C.= 2438605.83333333  JULY 29,1964 08 00 00.000
                                                TFL    0 DAYS 15 HRS.  9 MIN. 52.127 SEC.

      GEOCENTRIC                                                                                EQUATORIAL COORDINATES

     X  .14317609 06      Y  .54059040 05      Z  .54948838 04     DX  .15859850 01     DY  .10375267 01     DZ  .29312990 00
     R  .15314035 06    DEC  .20562916 01     RA  .20685049 02      V  .19177256 01    PTH  .75850046 02     AZ  .61101910 02
     R  .15314034 06    LAT  .20562916 01    LON  .31368425 03     VE  .10911552 02    PTL  .98122069 01    AZE  .27120736 03
    XS -.89746764 08     YS  .11241636 09     ZS  .48748598 08    DXS -.23545993 02    DYS -.16039925 02    DZS -.69556597 01
    XM  .38305863 06     YM  .19171908 05     ZM -.29643960 05    DXM -.59323371-01    DYM  .93394357 00    DZM  .40816362 00
    XT  .38305863 06     YT  .19171908 05     ZT -.29643960 05    DXT -.59323371-01    DYT  .93394357 00    DZT  .40816362 00
    RS  .15187909 09     VS  .29327021 02     RM  .38472182 06     VM  .10205639 01     RT  .38472182 06     VT  .10209439 01
   GED  .20702926 01    ALT  .14676716 06    LOS  .61599175 02    RAS  .12859997 03    RAM  .28649386 01    LOM  .29586414 03
   DUT  .35000000 02     DT  .19200000 04     DR  .18595404 01    SHA  .14703149 06    DES  .18721562 02    DEM -.44191904 01


12 GOLDSTONE ECHO
     R  .15314034 06    LAT  .20562916 01    LON  .31368425 03
   MIN .88006666 03      HA  .28765083 03     DEC  .69238566 00     ELE  .14770963 02     AZI  .99796648 02
   CKC  .25822257 03     CKM  .35787742 03     CKT  .35787742 03     PSS  .10495498 03     PSM  .19868223 02
    UT  .14667778 02     DHA  .40891561-02     DDE  .10406811-03     DEL  .33576147-02     DAZ  .24156107-02
    ET  .14658C55 02     RGE  .15139180 06     DRG  .15038176 01     DDR-.76821128-05     SLS  .19569612 03
   RDI  .63718688 04     PHI  .35117467 02     THI  .24319483 03     SPS  .74991255 02     PDL  .55882090 02
    DT  .50498863 00     RFB  .96004999 09     RF1  .96004999 09     RF2  .29668212 08      FA  .96004999 09
   BF1  .54815797 05      F1  .83815797 05      F2  .10963159 06      XA  .29668360 08     PRA  .22544792 02
    D1  .27938599 04      D2  .36543864 04     DOP-.49199552-01     DF1-.24601057-01     DF2-.49202114-01
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51 JOBURG 85 FT.
     R .15314034 06     LAT .20562916 01     LON .31368425 03
   MIN .88C06666 03      HA .76089256 02     DEC .312089C1 01     ELE .11104091 02     AZI .27898728 03
   CKC .26C01809 C3     CKM .16729502 01     CKT .167295C2 01     PSS .1C781957 03     PSM .18045184 02
    UT .14667778 C2     DHA .40355998-02     CDE .64441295-04     DEL-.3619BC77-02     CAZ-.18055054-02
    ET .14656055 02     RGE .15178464 06     DRG .22531674 01     DDR-.84884430-05     SLS .19571863 03
   RDI .63754553 04     PHI-.25739277 02     THI .27686085 02     SPS .72125933 02     PDL .22780111 03
    DT .50625900 00     RFB .96004999 09     RF1 .96004999 09     RF2 .29668212 08     FA .96004999 09
   BF1 .57215501 05      F1 .86215501 05      F2 .11443100 06      XA .29668434 08     PRA .18597624 02
    D1 .28738500 04      D2 .38143668 04     DOP-.54363636-01     DF1-.27183234-01     DF2-.54366468-01

      HELICCENTRIC                                                                              ECUATORIAL COORDINATES

     X  .89883880 08      Y -.11236230 09      Z -.447431C3 08     DX  .25131957 02     DY  .17077452 02     DZ  .72487895 01
     R  .15192198 09    LAT -.18713912 02    LON  .30865795 03      V  .31237791 02    PTH -.15975812 00     AZ  .75873642 02
    XE  .89746704 08     YE -.11241636 09     ZE -.48748598 08    DXE  .23545993 02    DYE  .16039925 02    DZE  .69556597 01
    XT  .90123862 C8     YT -.11239719 09     ZT -.48778242 08    DXT  .23586669 02    DYT  .16973869 02    DZT  .73638233 01
   LTE -.18721582 C2    LOE  .30859997 03    LTT -.18705031 02    LOT  .30872390 03    RST  .15210110 09    VST  .29899192 02
   EPS  .73706754 02    ESP  .55514057-01    SEP  .10623779 03    EPM  .14934121 03    EMP  .11711143 02    MEP  .18947641 02
   MPS  .13695183 03    MSP  .61770341-01    SMP  .42985171 02    SEM  .12518533 03    EMS  .54696224 02    ESM  .11786692 00
   RPM  .24497893 C6    SPN  .71319806 02
   GCE  .10178875 03    GCT  .28165485 03    SIP  .13654604 03    CPT  .91819001 02    SIN  .91413213 02     D1  .21247258 00
   RLP  .15314035 06    VEP  .19177256 01    CPE  .97309440 02    CPS  .76867629 02     C2  .15618036 00     D3  .16145593-02

   0 DAYS 15 HRS. 40 MIN.  4.000 SEC.        2356665037042020CC000CCC J.D.= 2438605.87500000  JULY 29,1964 09 00 00.000
                                          TFL    0 DAYS 16 HRS.  9 MIN. 52.127 SEC.

      GEOCENTRIC                                                                                ECUATORIAL COORDINATES

     X  .14878589 06      Y  .57755916 05      Z  .65460561 04     DX  .15314008 01     DY  .10165012 01     DZ  .29083493 00
     R  .15973678 06    DEC  .23486527 01     RA  .21215288 02      V  .18609266 01    PTH  .76027931 02     AZ  .61119729 02
     R  .15973678 06    LAT  .23486527 01    LON  .29917342 03     VE  .11341117 02    PTE  .91217662 01    AZE  .27110559 03
    XS -.89825452 C8     YS  .11235859 09     ZS  .44723545 08    DXS -.23533867 02    DYS -.16055259 02    DZS -.69622974 01
    XM  .38286747 06     YM  .22533057 05     ZM -.28173272 05    DXM -.69C9811C-01    DYM  .93334182 00    DZM  .40887656 00
    XT  .38286747 06     YT  .22533057 05     ZT -.28173272 05    DXT -.69C9811C-01    DYT  .93334182 00    DZT  .40887656 00
    RS  .15187839 09     VS  .29327253 02     RM  .38456335 06     VM  .1C2213136 01     RT  .38456335 06     VT  .10213136 01
   GED  .23646402 01    ALT  .15335861 06    LCS  .46598846 02    RAS  .12864071 03    RAM  .33681669 01    LUM  .28132631 03
   DUT  .35C0CCC00 02     DT  .19200000 04     DR  .18058684 01    SHA  .15379296 06    DES  .18711692 02    DEM -.42012757 01

12 GOLDSTONE ECHO
     R .15973678 06     LAT .23486527 01     LON .29917342 03
   MIN .94C06667 03      HA .30244215 03     DEC .10528378 01     ELE .26698552 02     AZI .10918019 03
   CKC .25647562 C3     CKM .35814887 03     CKT .35814887 03     PSS .1C463720 03     PSM .19805392 02
    UT .15667778 02     DHA .41269288-02     CDE .96302393-04     DEL .3249465A-02     CAZ .28485057-02
    ET .15658055 02     RGE .15677245 06     DRG .14899613 01     DDR-.14279493-06     SLS .19599947 03
   RDI .63718688 04     PHI .35117467 02     THI .24319483 03     SPS .75305589 02     PDL .59060210 02
    DT .52293655 C0     RFB .96004999 09     RF1 .96004999 09     RF2 .29668212 08     FA .96004999 09
   BF1 .54771424 05      F1 .83771425 05      F2 .10954285 06      XA .29668359 08     PRA .22794543 02
    D1 .27923808 04      D2 .36514283 04     DOP-.91452011-03     DF1-.45728387-03     DF2-.91456773-03
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51 JOBURG 85 FT.
     R .15973678 06     LAT .23486527 01     LON .29917342 03
   MIN .94C06667 03      HA .90574642 02     DEC .33410766 01     ELE-.19672490 01     AZI .27276144 03
   CKC .26C01660 C3     CKM .16898669 01     CKT .16898669 01     PSS .1C726193 03     PSM .18054838 02
    UT .15667778 C2     DHA .4C121786-02     CDE .58142145-04     DEL-.3635C827-02     CAZ-.16839824-02
    ET .15658C55 02     RGE .15982850 06     DRG .22121081 01     DDR-.14377185-04     SLS .19616716 03
   RDI .63754553 04     PHI-.25739277 02     THI .27686085 02     SPS .72685C09 02     PDL .22644883 03
    DT .53313043 00     RFB .96004999 09     RF1 .96004999 09     RF2 .29668212 08     FA .96004999 09
   BF1 .57C84C14 C5      F1 .86084C13 05      F2 .11416BC3 06      XA .2966843C 08     PRA .19153307 02
    D1 .28694671 04      D2 .38056009 04     DOP-.92C77673-01     DF1-.46C41234-01     DF2-.92082468-01

      HELICCENTRIC                                                                              ECUATORIAL COORDINATES

     X  .89974237 08      Y -.11230083 09      Z -.48716958 08     DX  .25C65267 02     DY  .17071760 02     DZ  .72531323 01
     R  .15192164 09    LAT -.18703561 02    LON  .30870134 03      V  .31182094 02    PTH -.18499482 00     AZ  .75848725 02
    XE  .89825452 08     YE -.11235859 09     ZE -.48723545 08    DXE  .23533867 02    DYE  .16055259 02    DZE  .69622974 01
    XT  .90208319 08     YT -.11233605 09     ZT -.48751718 08    DXT  .23664768 02    DYT  .16988601 02    DZT  .73711739 01
   LTE -.18711692 02    LOE  .30864071 03    LTT -.18694938 02    LOT  .3C876523 03    RST  .15209753 09    VST  .29892175 02
   EPS  .74262800 02    ESP  .57674939-01    SEP  .10567920 03    EPM  .14844595 03    EMP  .12554325 02    MEP  .18999726 02
   MPS  .13725124 03    MSP  .60570802-01    SMP  .42647628 02    SEM  .12467892 03    EMS  .55201948 02    ESM  .11931066 00
   RPM  .23524937 C6    SPN  .71974476 02
   GCE  .10170456 03    GCT  .28167325 03    SIP  .13687573 03    CPT  .91905441 02    SIN  .91489936 02     D1  .21756115 00
   RLP  .15973678 06    VEP  .18609266 01    CPE  .97386045 02    CPS  .76871780 02     C2  .16080951 00     D3  .17129430-02

   0 DAYS 16 HRS. 40 MIN.  4.000 SEC.        2356665055102020CC000CCC J.D.= 2438605.91666666  JULY 29,1964 10 00 00.000
                                          TFL    0 DAYS 17 HRS.  9 MIN. 52.127 SEC.

      GEOCENTRIC                                                                                ECUATORIAL COORDINATES

     X  .1542C754 C6      Y  .61379284 05      Z  .75887855 04     DX  .14813171 01     DY  .99666665 00     DZ  .28844840 00
     R  .16614744 06    DEC  .26178962 01     RA  .21704059 02      V  .18085483 01    PTH  .76185594 02     AZ  .61138051 02
     R  .16614743 06    LAT  .26178962 01    LON  .28462113 03     VE  .11857451 02    PTE  .85175505 01    AZE  .27101852 03
    XS -.8991C155 C8     YS  .11230076 09     ZS  .44698467 08    DXS -.23521729 02    DYS -.16070587 02    DZS -.69689323 01
    XM  .3826C111 06     YM  .25891886 05     ZM -.26700083 05    DXM -.7887921C-01    DYM  .93265398 00    DZM  .40955299 00
    XT  .3826C111 06     YT  .25891886 05     ZT -.26700083 05    DXT -.7887921C-01    DYT  .93265398 00    DZT  .40955299 00
    RS  .15187770 09     VS  .29327487 02     RM  .38440459 06     VM  .1C216648 01     RT  .38440459 06     VT  .10216648 01
   GED  .26357115 01    ALT  .15976928 06    LCS  .31598511 02    RAS  .12868144 03    RAM  .38714916 01    LUM  .26678856 03
   DUT  .35C0CCC0 02     DT  .19200000 04     DR  .17562348 01    SHA  .16C35965 06    DES  .18701792 02    DEM -.39828728 01

12 GOLDSTONE ECHO
     R .16614743 06     LAT .26178962 01     LON .28462113 03
   MIN .10CCC667 04      HA .31735470 03     DEC .13864481 01     ELE .37581944 02     AZI .12076829 03
   CKC .25674417 03     CKM .35843620 03     CKT .35843620 03     PSS .1C444373 03     PSM .19649201 02
    UT .16667777 C2     DHA .41563610-02     CDE .89111379-04     DEL .29846230-02     CAZ .36694314-02
    ET .16658055 02     RGE .16215017 06     DRG .15015941 01     DDR .64C15727-05     SLS .19629242 03
   RDI .63718688 04     PHI .35117467 02     THI .24319483 03     SPS .75497045 02     PDL .65047187 02
    DT .54C87469 00     RFB .96004999 09     RF1 .96004999 09     RF2 .29668212 08     FA .96004999 09
   BF1 .54808676 05      F1 .83808676 05      F2 .10961735 06      XA .29668360 08     PRA .22923060 02
    D1 .27936225 04      D2 .36539118 04     DOP .40998423-01     DF1 .2050C279-01     DF2 .41000558-01
```

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.90064362 08	Y	-.11223937 09	Z	-.48690879 08	DX	.25003046 02	DY	.17067253 02	DZ	.72573807 01
R	.15192125 09	LAT	-.18693211 02	LON	.30874464 03	V	.31130579 02	PTH	-.20719720 00	AZ	.75824794 02
XE	.89510155 08	YE	-.11230076 09	ZE	-.48698467 08	DXE	.23521729 02	DYE	.16070587 02	DZE	.69689323 01
XT	.90292756 08	YT	-.11227486 09	ZT	-.48725168 08	DXT	.23442850 02	DYT	.17003240 02	DZT	.73784853 01
LTE	-.18701792 02	LOE	.30868144 03	LTT	-.18684836 02	LOT	.30880665 03	RST	.15209395 09	VST	.29885104 02
EPS	.74771950 02	ESP	.59347024-01	SEP	.10516757 03	EPM	.14760713 03	EMP	.13388326 02	MEP	.19004539 02
MPS	.13762088 03	MSP	.58933450-01	SMP	.42319751 02	SEM	.12417209 03	EMS	.55708099 02	ESM	.11931066 00
RPM	.23366366 06	SPN	.72571964 02								
GCE	.10162818 03	GCT	.28169203 03	SIP	.13719544 03	CPT	.91988732 02	SIN	.91563354 02	D1	.22276222 00
REP	.16614744 06	VEP	.18085483 01	CPE	.97455885 02	CPS	.76875924 02	D2	.16553106 00	D3	.18165715-02

0 DAYS 17 HRS. 7 MIN. 13.000 SEC. 2356665063372022000000C0 J.C.= 2438605.93552083 JULY 29,1964 10 27 09.000

TFL 0 DAYS 17 HRS. 37 MIN. 1.127 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.15660311 06	Y	.62995801 05	Z	.80577761 04	DX	.14599562 01	DY	.98804850 00	DZ	.28734779 00
R	.16895092 06	DEC	.27329952 01	RA	.21911153 02	V	.17861356 01	PTH	.76251059 02	AZ	.61146415 02
R	.16895092 06	LAT	.27329952 01	LON	.27802414 03	VE	.12064349 02	PTE	.82682940 01	AZE	.27098316 03
XS	-.89948465 08	YS	.11227458 09	ZS	.40687116 08	DXS	-.23516234 02	DYS	-.16077519 02	DZS	-.69719336 01
XM	.38246901 06	YM	.27410894 05	ZM	-.26032685 05	DXM	-.83306964-01	DYM	.93231440 00	DZM	.40984705 00
XT	.38246901 06	YT	.27410894 05	ZT	-.26032685 05	DXT	-.83306964-01	DYT	.93231440 00	DZT	.40984705 00
RS	.15187739 09	VS	.29327593 02	RM	.38433267 06	VM	.10218742 01	RT	.38433267 06	VT	.10218742 01
GEO	.27515914 01	ALT	.16261276 06	LOS	.24810858 02	RAS	.12869987 03	RAM	.40992793 01	LUM	.26021027 03
DUT	.35000000 02	DT	.19200000 04	DR	.17349569 01	SMA	.16327100 06	DES	.18697310 02	DEM	-.38838905 01

12 GOLDSTONE ECHO

R	.16899092 06	LAT	.27329952 01	LON	.27802414 03				
MIN	.10272167 04	RA	.32413411 03	DEC	.15290556 01	ELE	.42686987 02	AZI	.12717714 03
CKC	.25686842 03	CKM	.35856904 03	CKT	.35856904 03	PSS	.10438853 03	PSM	.19553130 02
UT	.17120278 02	DHA	.41667337-02	DDE	.85986977-04	DEL	.27808189-02	DAZ	.42203080-02
ET	.17115555 02	RGE	.16460591 06	DRG	.15141134 01	DDR	.89170223-05	SLS	.19642798 03
RDI	.63718688 04	PHI	.35117467 02	THI	.24319483 03	SPS	.75551336 02	PDL	.69057700 02
DT	.54906614 00	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.54848768 05	F1	.83848768 05	F2	.10969754 06	XA	.29668361 08	PHA	.22949725 02
D1	.27945589 04	D2	.36565845 04	DOP	.57108442-01	DF1	.28555708-01	DF2	.57111417-01

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.90105068 08	Y	-.11221158 09	Z	-.48679058 08	DX	.24976190 02	DY	.17065567 02	DZ	.72592814 01
R	.15192107 09	LAT	-.18688527 02	LON	.30876420 03	V	.31108532 02	PTH	-.21637954 00	AZ	.75814255 02
XE	.89948465 08	YE	-.11227458 09	ZE	-.48687116 08	DXE	.23516234 02	DYE	.16077519 02	DZE	.69719336 01
XT	.90330934 08	YT	-.11224716 09	ZT	-.48713148 08	DXT	.23432927 02	DYT	.17009833 02	DZT	.73817807 01
LTE	-.18697310 02	LOE	.30869986 03	LTT	-.18680264 02	LOT	.30882538 03	RST	.15209232 09	VST	.29881887 02
EPS	.74988687 02	ESP	.61373100-01	SEP	.10494973 03	EPM	.14724423 03	EMP	.13762833 02	MEP	.18992931 02
MPS	.13776656 03	MSP	.58097472-01	SMP	.42174497 02	SEM	.12394261 03	EMS	.55937274 02	ESM	.12012787 00
RPM	.23117927 06	SPN	.72825736 02								
GCE	.10159588 03	GCT	.28170062 03	SIP	.13733695 03	CPT	.92025550 02	SIN	.91595539 02	D1	.22515629 00
REP	.16899092 06	VEP	.17861356 01	CPE	.97485531 02	CPS	.76877796 02	D2	.16770444 00	D3	.18653073-02

2 DAYS 19 HRS. 23 MIN. 40.021 SEC. 2356666366362020026155C3 J.C.= 2438608.03027802 JULY 31,1964 12 43 36.027

TFL 2 DAYS 19 HRS. 53 MIN. 28.148 SEC.

GEOCENTRIC — EQUATORIAL COORDINATES

X	.32423561 06	Y	.18747981 06	Z	.48409330 05	DX	.11524817 01	DY	-.10547539 01	DZ	-.28494997 00
R	.37765179 06	DEC	.73647290 01	RA	.30037355 02	V	.16173172 01	PTH	.16659937 02	AZ	.25704914 03
R	.37765178 06	LAT	.73647290 01	LON	.24997115 03	VE	.28827449 02	PTE	.92160340 00	AZE	.26930971 03
XS	-.94148507 08	YS	.10929550 09	ZS	.47395325 08	DXS	-.22890618 02	DYS	-.16839243 02	DZS	-.73016720 01
XM	.32335906 06	YM	.18600470 06	ZM	.48148523 05	DXM	-.56215405 00	DYM	.78363854 00	DZM	.39333130 00
XT	.32335906 06	YT	.18600470 06	ZT	.48148523 05	DXT	-.56215405 00	DYT	.78363854 00	DZT	.39333130 00
RS	.15184125 09	VS	.29340329 02	RM	.37613443 06	VM	.10415450 01	RT	.37613443 06	VT	.10415450 01
GEO	.74143615 01	ALT	.37127393 06	LOS	.35067577 03	RAS	.13074202 03	RAM	.29908650 02	LUM	.24984241 03
DUT	.35000000 02	DT	.59999999 02	DR	.46366987 00	SMA	.37419470 06	DES	.18188083 02	DEM	.73545461 01

12 GOLDSTONE ECHO

R	.37765178 06	LAT	.73647290 01	LON	.24997115 03				
MIN	.40436670 04	RA	.35312828 03	DEC	.69070747 01	ELE	.61C9C504 02	AZI	.16577670 03
CKC	.25904495 03	CKM	.18722283 03	CKT	.18722283 03	PSS	.97824574 02	PSM	.12953282 00
UT	.67394450 02	DHA	.44709721-02	DDE	-.52014218-04	DEL	.84762565-03	DAZ	.90130033-02
ET	.67384727 02	RGE	.37206138 06	DRG	.41878834 00	DDR	.0000C000 00	SLS	.20350636 03
RDI	.63718688 04	PHI	.35117467 02	THI	.24319483 03	SPS	.82036385 02	PDL	.97831405 02
DT	.12410630 01	RFB	.96004999 09	RF1	.96004999 09	RF2	.29668212 08	FA	.96004999 09
BF1	.51341119 05	F1	.80341119 05	F2	.10268224 06	XA	.29668253 08	PHA	.30132793 02
D1	.26780373 04	D2	.34227413 04						

HELIOCENTRIC — EQUATORIAL COORDINATES

X	.94472743 08	Y	-.10910802 09	Z	-.47346916 08	DX	.24C831CC 02	DY	.15784489 02	DZ	.70167220 01
R	.15189269 09	LAT	-.18162489 02	LON	.31088812 03	V	.29637479 02	PTH	.28108823 01	AZ	.74598977 02
XE	.94148507 08	YE	-.10929550 09	ZE	-.47395325 08	DXE	.22890618 02	DYE	.16839243 02	DZE	.73016720 01
XT	.94471867 08	YT	-.10910950 09	ZT	-.47347177 08	DXT	.22328464 02	DYT	.17622882 02	DZT	.76900034 01
LTE	-.18188C83 02	LOE	.31074202 03	LTT	-.18162519 02	LOT	.31C8E747 03	RST	.15189329 09	VST	.29467598 02
EPS	.821CC325 02	ESP	.14162C04 0C	SEP	.97758522 02	EPM	.28879C35 02	EMP	.15089287 03	MEP	.12801432 00
MPS	.11007384 03	MSP	.27453512-18	SMP	.69925540 02	SEM	.97882225 02	EMS	.81977232 02	ESM	.14075386 00
RPM	.17355999 04	SPN	.81132635 02								
GCE	.10048762 03	GCT	.10817786 03	SIP	.21580401 02	CPT	.11124214 03	SIN	.22748700 02	D1	.11406909 04
REP	.37765179 06	VEP	.16173172 01	CPE	.98438506 02	CPS	.77C86566 02	D2	.16853510 03	D3	.15850172 05

SELENOCENTRIC — EQUATORIAL COORDINATES

X	.87655208 03	Y	.14751C79 04	Z	.26080731 03	DX	.17546358 01	DY	-.18383924 01	DZ	-.67828127 00
R	.17355999 04	DEC	.86425411 01	RA	.59279985 02	V	.26303039 01	PTH	-.17209787 02	AZ	.25693947 03
R	.17355998 04	LAT	-.12349145 02	LON	.20357582 03	VP	.26346577 01	PTP	-.17180460 02	AZP	.26759251 03
LTS	.94222458 00	LNS	.27278120 03	LTE	.58682357 01	LNE	.35481260 03				
ALT	.59994507 00	SHA	-.16301576 04	ALP	.17570380 03	OR	-.77823128 00	DP	.82944173-01	ASD	.88493441 02
HGE	.27789967 03	SVL	-.72205003 01	PNG	.24975869 03	SIA	-.59514406 02				

SELENOCENTRIC CONIC

EPOCH OF PERICENTER PASSAGE 2356666367552024660275C3 J.C.= 2438608.03396321 JULY 31,1964 12 48 54.422

SMA	-.38635890 04	ECC	.14155564 01	H	.38713231 04	SLR	.38786718 04	APC	.00000000 00	RCA	.16057053 04
VH	.11264271 01	C3	.12688379 01	C1	.43607634 04	TFP	-.31846054 03	TF	.67482894 02	LTF	.67151753 02
TA	-.29274371 02	MTA	.13494567 03	EA	-.12462231 02	MA	-.53181872 01	L3J	-.19276924 01	TFL	.67394450 02
ZAE	.13386514 03	ZAP	.14411547 03	ZAC	.94065874 02	DEF	.85891347 02	IR	.40519446 04	GP	.83171127 00

```
UP1  .78996744 01    UY -.27079587 01   UP2  .26889464 02

                                                    ALL VECTORS REFERENCED TO EARTH EQUATOR PLANE
  X  .87655208 03     Y  .14751079 04     Z  .26080731 03   DX  .17546358 01    DY -.18383924 01    DZ -.67828127 00
INC  .16438044 03   LAN  .20634622 03   APF  .17534943 03   MX  .85478289 00    MY -.46843602 00    MZ -.22341421 00
 WX -.11945097 00    WY  .24128130 00    WZ -.96307074 00   PX  .85852496 00    PY  .51230681 00    PZ  .21830251-01
 QX  .49865494 00    QY -.82421175 00    QZ -.26836206 00   RX -.17004805 00    RY  .39248820-01    RZ -.98465382 00
 BX  .25537635 00    BY  .94485183 00    BZ  .20503158 00   TX -.22489739 00    TY -.97438245 00    TZ  .00000000 00
SXI  .95942941 00   SYI -.22144607 00   SZI -.17451879 00  DAI -.10050656 02   RAI  .34700315 03
SXO -.25355649 00   SYO -.94527002 00   SZO -.20536214 00  DAO -.11850699 02   RAO  .25498460 03
ETE  .20052832 03   ETS  .17163414 02   ETC  .30508900 03
BTQ -.37864657 04   BRQ -.80611421 03    B  .38713231 04   THA  .19201847 03

                                                    ALL VECTORS REFERENCED TO ECLIPTIC PLANE
  X  .87655208 03     Y  .14571005 04     Z -.34759418 03   DX  .17546358 01    DY -.19564882 01    DZ  .10911538 00
INC  .16839663 03   LAN  .32355276 03   APF  .29396718 03   MX  .80823039 00    MY -.47676555 00    MZ -.19843839-01
 WX -.11949096 00    WY -.16179426 00    WZ -.97956346 00   PX  .85852496 00    PY  .47870126 00    PZ -.18379319 00
 QX  .49865494 00    QY -.86294129 00    QZ  .81703934-01   RX -.69268317-01    RY  .19680875-01    RZ -.99740387 00
 BX  .25537631 00    BY  .94842655 00    BZ -.18780318 00   TX -.27330763 00    TY -.96192668 00    TZ  .00000000 00
SXI  .95942941 00   SYI -.27259809 00   SZI -.72009975-01  DAI -.41294418 01   RAI  .34413882 03
SXO -.25355652 00   SYO -.94894172 00   SZO  .18766629 00  DAO  .10816623 02   RAO  .25504009 03
ETE  .17765672 03   ETS  .35429182 03   ETC  .28221741 03
BTC -.38020773 04   BRC  .72893921 03    B  .38713233 04   THA  .16914687 03

                                                    ALL VECTORS REFERENCED TO ORBIT PLANE OF TARGET
  X -.73080356 03     Y -.15520332 04     Z -.26348830 03   DX -.19510682 01    DY  .17443174 01    DZ  .26303682 00
INC  .17065391 03   LAN  .17584057 03   APF  .32007376 03   MX  .86296920 00    MY -.50010848 00    MZ -.71790554-01
 WX  .11778978-01    WY  .16196978 00    WZ -.98672542 00   PX -.81078468 00    PY -.57599045 00    PZ -.10422682 00
 QX -.58522601 00    QY  .80124954 00    QZ  .12453803 00   RX -.14328027-01    RY  .23257164-02    RZ -.99989465 00
 BX -.16042990 00    BY -.97370427 00    BZ -.16174749 00   TX  .16022236 00    TY  .98708095 00    TZ  .00000000 00
SXI -.98697696 00   SYI  .16020548 00   SZI  .14515554-01  DAI  .83170871 00   RAI  .17078019 03
SXO  .15855809 00   SYO  .97400631 00   SZO  .16177473 00  DAO  .93099242 01   RAO  .80753945 02
ETE  .16270511 03   ETS  .32633303 03   ETC  .26124025 03
BTO -.38203359 04   BRO  .62624285 03    B  .38713235 04   THA  .17069066 03

                                                    ALL VECTORS REFERENCED TO TRUE LUNAR EQU. PLANE
  X -.15539265 04     Y -.67811295 03     Z -.37118988 03   DX -.28653502 00    DY  .26138873 01    DZ  .63152052-01
INC  .16742112 03   LAN  .10243447 03   APF  .28839398 03   MX  .83655871 00    MY -.52487870 00    MZ  .15707159 00
 WX  .21267480 00    WY  .46893757-01    WZ -.97599714 00   PX -.97235321 00    PY  .10873013 00    PZ -.20665661 00
 QX  .96429396-01    QY  .99296459 00    QZ  .68721456-01   RX  .60513695-01    RY -.76257280-01    RZ -.99525013 00
 BX -.75633009 00    BY -.62450965 00    BZ -.19481405 00   TX  .78332870 00    TY  .62160772 00    TZ  .00000000 00
SXI -.61865517 00   SYI  .77960799 00   SZI -.97350256-01  DAI -.55866097 01   RAI  .12843363 03
SXO  .75515610 00   SYO  .62598616 00   SZO  .19462917 00  DAO  .11223062 02   RAO  .39657013 02
ETE  .52037631 00   ETS  .18133118 03   ETC  .25517644 03
BTT -.37964347 04   BRT  .75778784 03    B  .38713252 04   THA  .16871182 03
615457036351   615405731631   613546504003   203702004474   603671135603   603462443010
                 640702817                      1956000                      000000000000

                                                                               RA-7 PREMIDC

                TIME ON   11090       TIME OFF   11095

                                MONITOR CONTROL WORDS

TRAJ      SAVE
```

APPENDIX D

Received Frequency Equations

The DSIF receiver may be visualized conceptually by Fig. D-1. $f_{s/c}$ is the spacecraft transmitted frequency. f_{rc} is the received carrier frequency, and f_v is the receiver VCO frequency. In Fig. D-2 the receiver block of Fig. D-1 is expanded into a block diagram valid for all receiving modes. $\dot{r}_R$ is the radial velocity from the receiving station to the spacecraft. f_m is the mixer frequency, a conceptual convenience. C is the speed of light. The units of frequency are megacycles.

Table D-1 is necessary to particularize the model to a given receiving mode.

In Fig. D-3 the DOPPLER COUNTING SYSTEM block of Fig. D-1 is expanded.

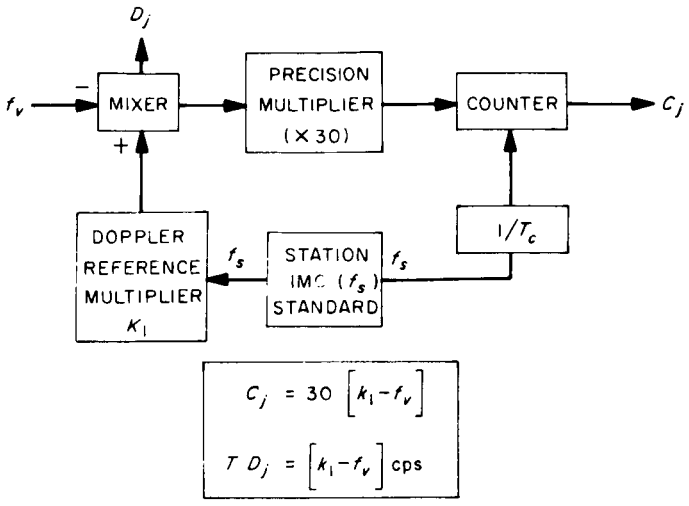

Fig. D-3. Doppler counting system diagram

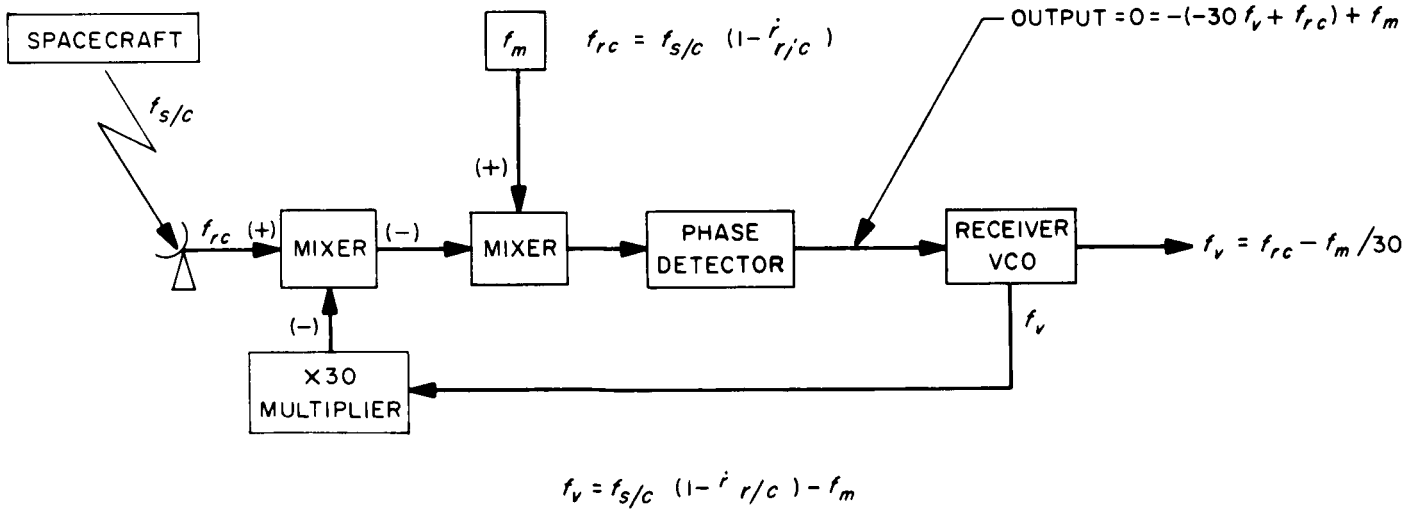

Fig. D-1. DSIF receiver doppler block diagram

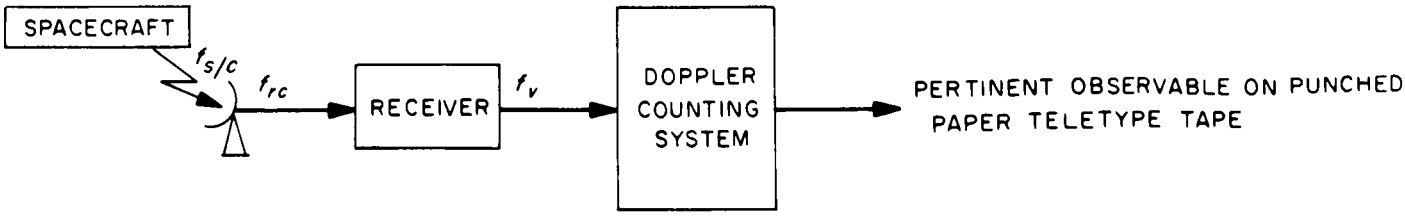

Fig. D-2. Receiver diagram for all receiving modes

Table D-1. Definitions to particularize receiver to a given receiving mode

Mode	Definition	Remarks
DSIF 1-way	$f_{s/c} = 960.05$ Mc (nominal) $f_m = \frac{30}{31} f_v$	$f_{s/c}$ is the 1-way transponder frequency, sometimes labeled f_T.
DSIF 2-way, 2-station (noncoherent)	$f_{s/c} = (30) \frac{(96)}{(89)} f_{r_T} \left(1 - \frac{\dot{r}_T}{C}\right)$ $f_m = \frac{30}{31} f_v$	f_{r_T} is the reference oscillator at the transmitting station, nominally 29.668212 Mc. r_T is range rate at the transmitter station.
MTS 1-way	$f_{s/c} = 960.05$ Mc $f_m = \frac{30}{29\,2/3} f_{r_R}$	f_{r_R} is the reference oscillator frequency, nominally 29.668212 Mc.
MTS 2-way, 2-station (noncoherent)	$f_{s/c} = (30) \frac{(96)}{(89)} f_{r_T} \left(1 - \frac{\dot{r}_T}{C}\right)$ $f_m = \frac{30}{29\,2/3} f_{r_R}$	
All stations 2-way, 2-station coherent	$f_{s/c} = (30) \frac{(96)}{(89)} f_{r_R} \left(1 - \frac{\dot{r}_T}{C}\right)$ $f_m = \frac{30}{29\,2/3} f_{r_R}$	In this case the transmitter and the receiver are identical or coherent.

D_j (CPS) is the doppler detector output. c_j is the pertinent observable on punched paper TTY tape. K_1 is a convenience to generalize the block diagram. It takes on two values listed in Table D-2. For convenient use in the various computer programs used during a tracking mission, the equations for c_j are rearranged according to Table D-3.

All equations for detector output D used in the predictions are derived from the relationship

$$D_j = \frac{C_j}{30} \text{ with } T_c = 0$$

Table D-2. Definition of K_1

Mode	Definition
All 1-way and 2-way 2-station noncoherent modes	$K_1 = 31.005$
All 2-way and 2-station coherent modes	$K_1 = \left[\frac{31}{29\,2/3} \frac{f_{r_R}}{f_s} + \frac{1}{300}\right]$

Table D-3. Equations for $T_C c_j$

Mode	Equation for $T_C f_j$, Mc
DSIF 1-way	$C_1 = \left[960.141 - (960.05)\left(1 - \frac{\dot{r}_R}{c}\right)\right] T_C$
DSIF 2-way 2-station (noncoherent)	$C_3 = \left[930.15 - (30)\left(\frac{31}{32}\right)\left(\frac{96}{89}\right)\left(1 - \frac{\dot{r}_T}{c}\right)\left(1 - \frac{\dot{r}_R}{c}\right) f_{r_T}{}^{a}\right] T_C$
MTS 1-way	$C_1 = \left[930.15 + \frac{30}{29\,2/3} f_{r_R} - 960.05\left(1 - \frac{\dot{r}_R}{c}\right)\right] T_C$
MTS 2-way 2-station (noncoherent)	$C_3 = \left[930.15 + \frac{30}{29\,2/3} f_{r_R} - (30)\left(\frac{96}{89}\right)\left(1 - \frac{\dot{r}_T}{c}\right)\left(1 - \frac{\dot{r}_R}{c}\right) f_{r_T}{}^{a}\right] T_C$
All stations 2-way and 2-way 2-station (coherent)	$C_2 = \left[(30)\left(\frac{96}{89}\right) f_{r_R}\left(\frac{2R_R}{c}\right) + 0.1\right] T_C$
Note $\left(1 - \frac{\dot{r}_x}{c}\right)\left(1 - \frac{\dot{r}_y}{c}\right) = 1 - \frac{\dot{r}_x + \dot{r}_y}{c}$	